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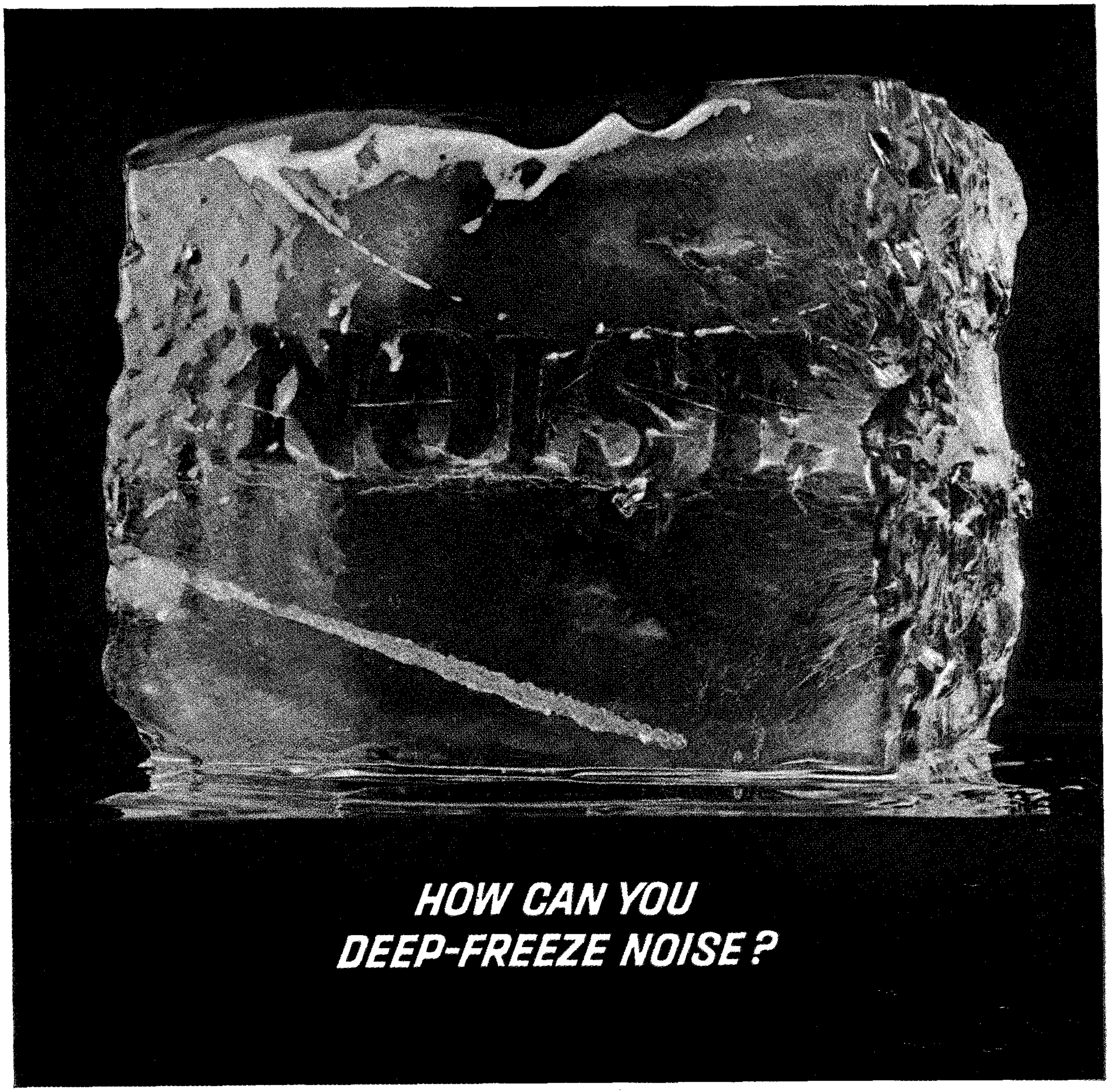
SCIENCE FACT → SCIENCE FICTION

UNDERCURRENTS BY JAMES H. SCHMITZ



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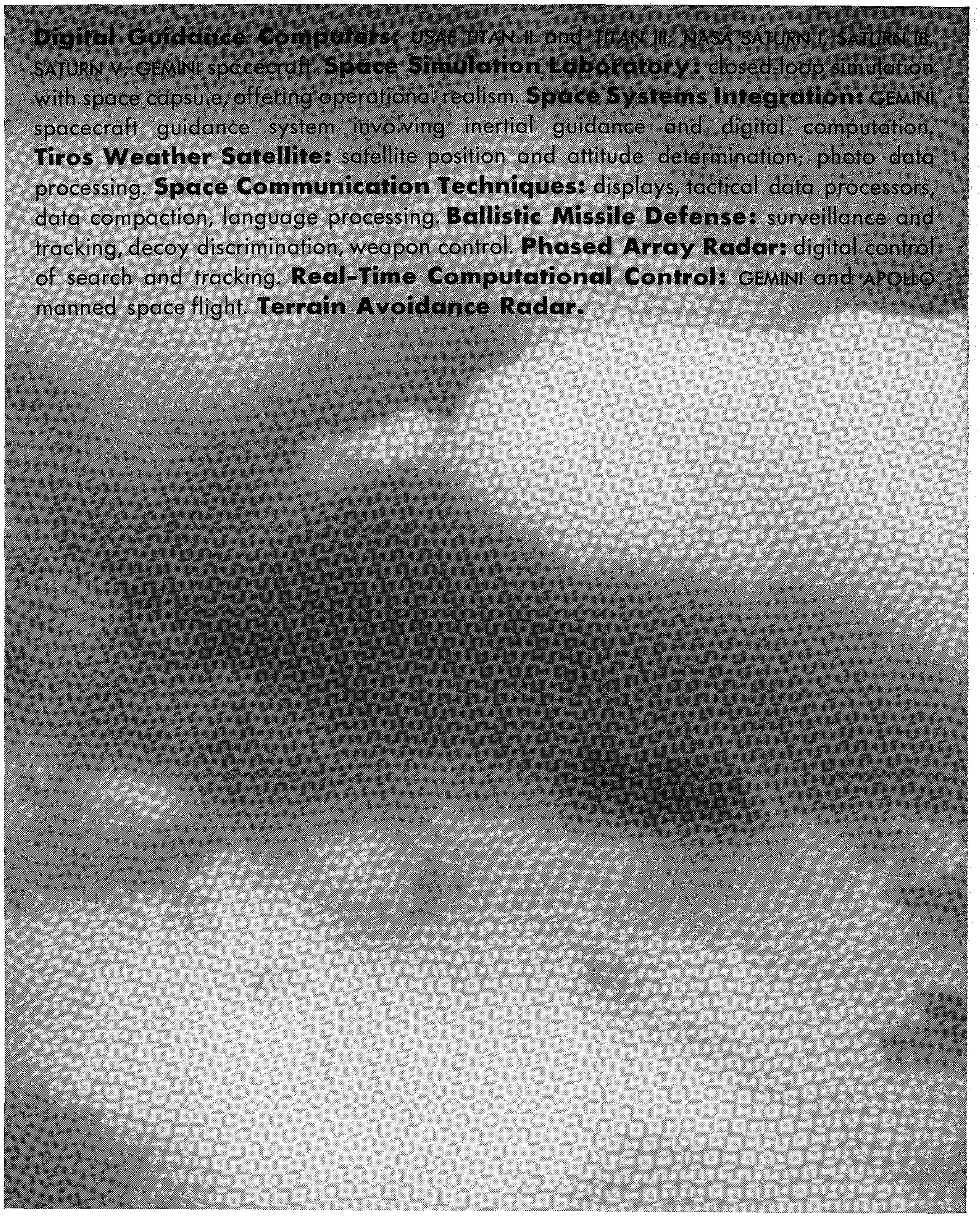

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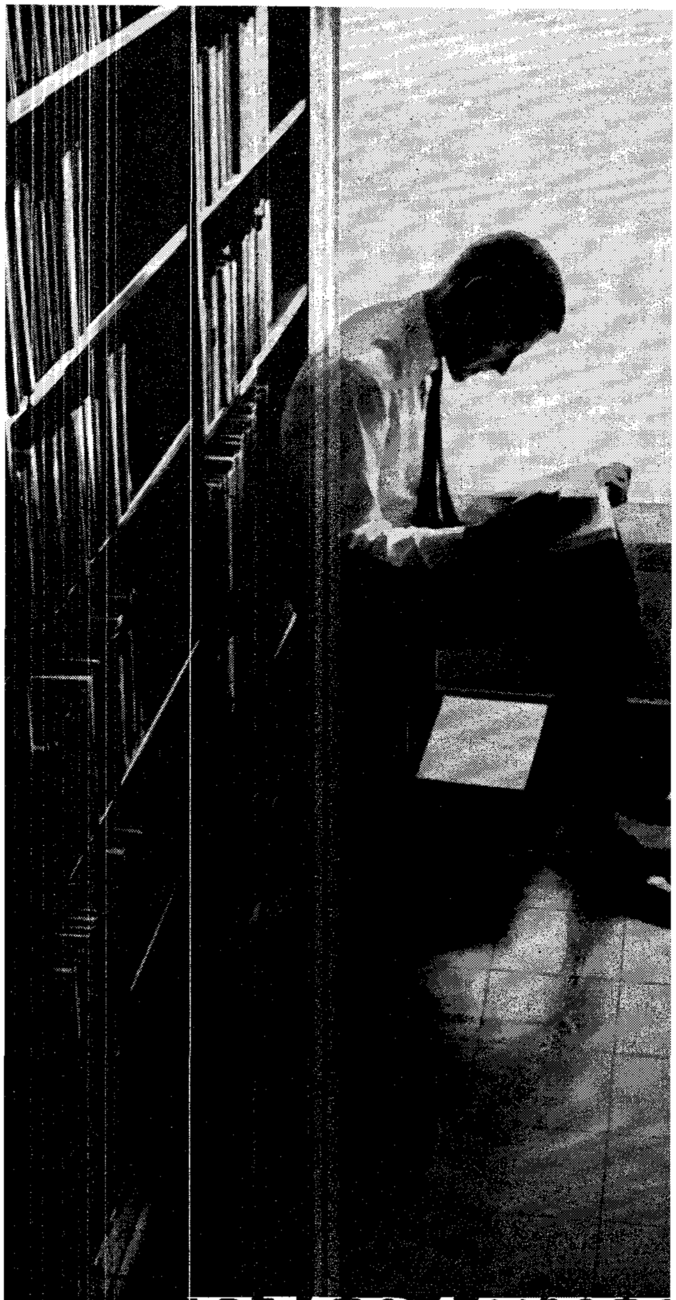

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AND ADVERTISING OFFICE:
420 LEXINGTON AVENUE,
NEW YORK, N.Y. 10017

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POSTMASTER: SEND FORM 3579 TO ANALOG SCIENCE FACT • SCIENCE FICTION, BOULDER, COLORADO.

Vol. LXXIII, No. 3 | May 1964

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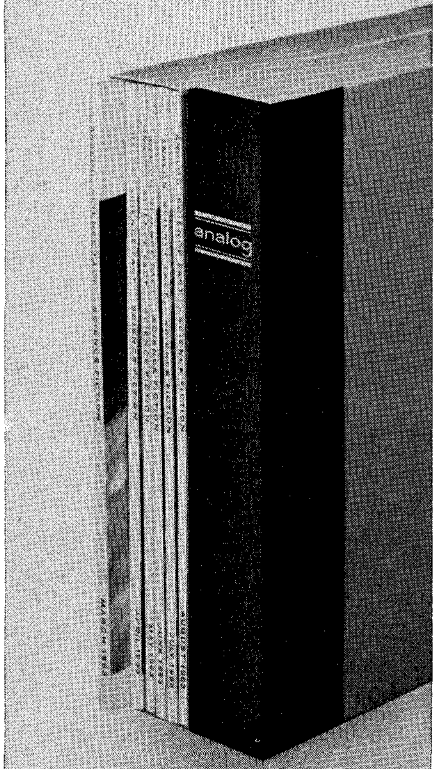

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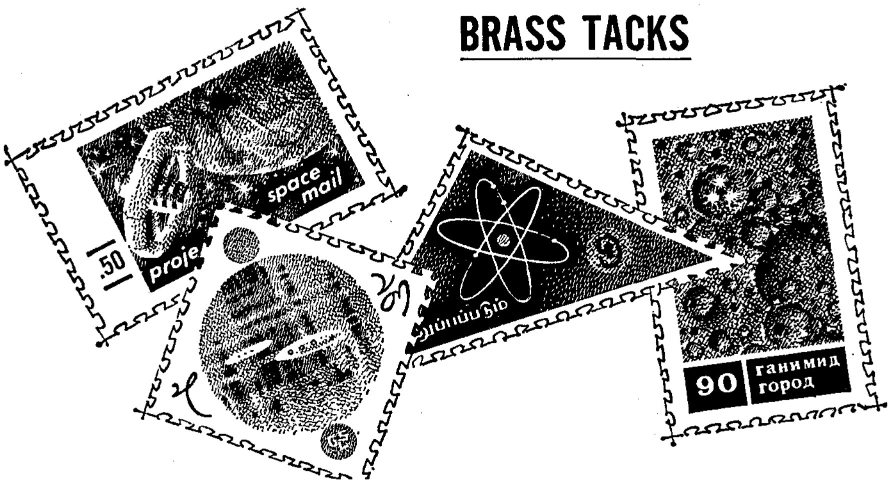


Dear Mr. Campbell:

I have just read your editorial in the November Analog and I would like to attempt to identify the aircraft on page 85. I am a member of the American Aviation Historical Society and Air-Britain and am very interested in aircraft recognition. I have read science fiction for twelve years and Analog for three.

The aircraft has to be one of the rear-engined jet transports. With the exception of the Sud-Aviation Caravelle, I would eliminate the foreign aircraft as I doubt that you would have the opportunity to photograph any of them. (Besides, this photo doesn't look like any of them, to me.) The remaining possibilities are the North American N.A. 246 Sabreliner, the Lockheed Jetstar, the Sud-Aviation Caravelle, and the Boeing 727. The Boeing 727 I would eliminate because it is too new to be in general circulation. Because of the apparent gap between the engine nacelles and the wing, I would simultaneously eliminate the two remaining American aircraft and choose the Sud-Aviation Caravelle as the probable aircraft in the photo.

George Gillburg

1704 Hodges
Bakersfield, California 93304

Correct!

Dear Mr. Campbell:

I have just read the article on the ARIS Ships in Analog Magazine. I must say that this article conspicuously avoids any mention of Sperry and its full responsibility. As a matter of fact, it seems to me that except for the Univac Computer, full credit for the instrumentation went to ITT Federal Labs. Let us set the matter straight—ITT was responsible only for the telemetry, communications and assembly of GFE weather station. In the case of the telemetry, the antenna dish, pedestal and servos including the electronics for the servos were all supplied by Sperry. It would seem to me that a technical article should be accurate and give credit to all participants of a program of this size, describing the magnitude of each task.

E. J. Venaglia
Program Manager, Aris
Sperry Gyroscope Company
Division of Sperry Rand Corporation
Great Neck, New York

Sorry, sir! We intend to give credit where credit is earned. On this one we slipped.

Dear Mr. Campbell:

Your editorial "Fully Identified" was called to my attention by several friends.

Of course, it is excellent and directly to the point. It was a surprise because I entertained the idea that very few human beings had the breadth of experience and knowledge plus the perspicacity to perceive the scientific inadequacy of the release of the prosecutors and administrators of the FDA who designed and released, as a "smear," the statement that "Krebiozen" consisted of nothing but creatine.

Four of the six FDA chemists, however, reported that something else was present other than creatine.

I enclose a statement which I wrote and released thereafter.

In the Press Conference in New York City, I pointed out that Dr. Durovic had competent chemists and that very probably no one now living had discovered and established the existence of more "hormones" than I. I reviewed the biological and chemical story of the development of insulin, cortisone, et cetera. I indicated that in the case of "secretin," I and a Swedish chemist thought we had crystalized "secretin" as the picrolonate. About three years later, we reported that the "secretin" was probably absorbed to crystals of picrolonic acid plus some unknown substance. Today, "secretin" is known to be exceedingly potent (0.025 of a microgram is a cat unit). The same is true of "cholecystokinin," the gall bladder hormone which I discovered. Both are used extensively for diagnostic purposes in Scandinavia. Yet, in neither case is the percentage composition (C H N O) known, and the only way a preparation of either can be identified is by injecting it into an animal or a human. As you did, I also used B_{12} as another example.

A. C. Ivy, Ph.D., M.D.
Roosevelt University
430 South Michigan Avenue
Chicago 5, Illinois

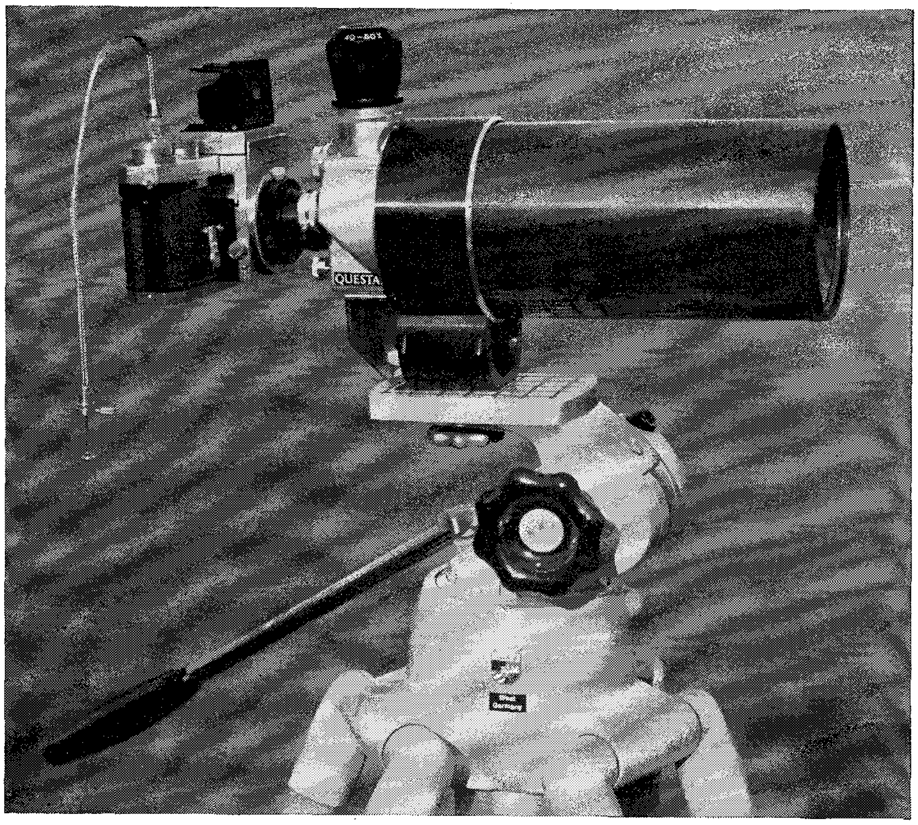
The major trouble is not lack of knowledge and analytical thinking ability—but the failure of the public, and even of scientifically trained members of the public to remain aware that good-intentioned censorship exists, and is as dangerous as ill-intentioned censorship!

To: John W. Campbell,
Subject: Epidemic

Beginning around the 28th of January, 1964 and lasting through February 14, 1964, the United States is in for another severe epidemic as Mars conjoins Saturn at the time of a Sun-Moon conjunction in Aquarius.

Since this happens in the areas of

continued on page 91



This is the New Field Model Questar Telescope. It weighs less than 3 pounds and costs only $795. Included in the price are this 4-lb. case, one eyepiece, and an improved basic camera coupling set. There is room for cameras and other accessories.

Twenty-one major changes in this barrel and control-box assembly permit a much wider photographic field of view, which now covers all but the very corners of the 24x36 mm. film frame at f/16 without extension tubes. Exposures are two f-numbers faster.

The New Field Model is optically identical in quality to all Questars. Since only an average of one out of three perfect optical systems surpasses theory by enough to satisfy us, we can continue to state that no amount of money, time or human effort can noticeably improve Questar's power of resolution. For whereas Lord Rayleigh's criteria sets 1.4 seconds of arc as Questar's limit of resolution, a Questar has resolved two stars but 0.6 second apart.

Because our function is to make the world's finest small telescopes in limited number, instead of many of ordinary quality, this New Field Model offers a new experience to the photographer. We offer him the world's sharpest lens, of 89-mm. aperture. We provide him with a low-power wide-field finder view, like that of a field glass, to let him locate distant objects rapidly. With flick of finger he can bring to bear a high-power view of 40-80x or 80-160x to study the object minutely through this superfine telescope. Another finger flick and slight refocusing brings the object to the clear bright center of his cameras' groundglass.

At this point he is challenged to capture on the sensitive emulsion what this superb telescope of 56 inches focal length is projecting to his film. He has seen it in Questar's eyepiece and in his reflex camera's groundglass. All that remains is to place the image in exact focus on the film and expose correctly with no vibration at all. And at long last we have the only camera able to do this, the Questar-modified Nikon F.

For the first time, then, Questar has a true photographic model, and a camera without mirror slap, shutter vibration, or too-dim focusing. Moreover, from now on we can measure the actual picture-taking light at the groundglass, and abandon inexact exposure calculations entirely, using the new cadmium sulfide meters.

With this new control of vibration, sharp focus, and correct exposure times, only one other factor remains to interfere with high resolution telescopic photography. We need quiet air for good seeing—which is no problem at 7 to 100 feet. But how can we get trembling air to stand still while we take sharp pictures at great distances? There are several things we can do to take advantage of nature's moods, and if you write for literature we will tell you more about it.

New Field Model, $795 in case with basic couplings as shown. The 80-160X eyepiece, $35. Questar-modified Nikon F bodies, from $234.60. Complete outfit shown, with camera and tripod, $1332, postpaid in U.S.

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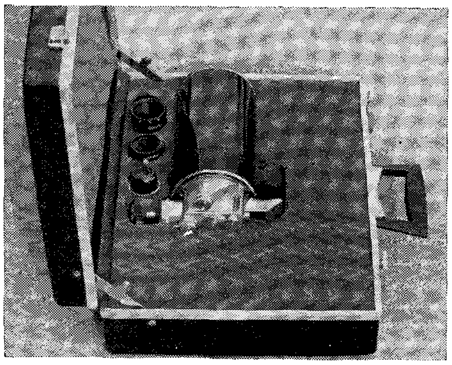

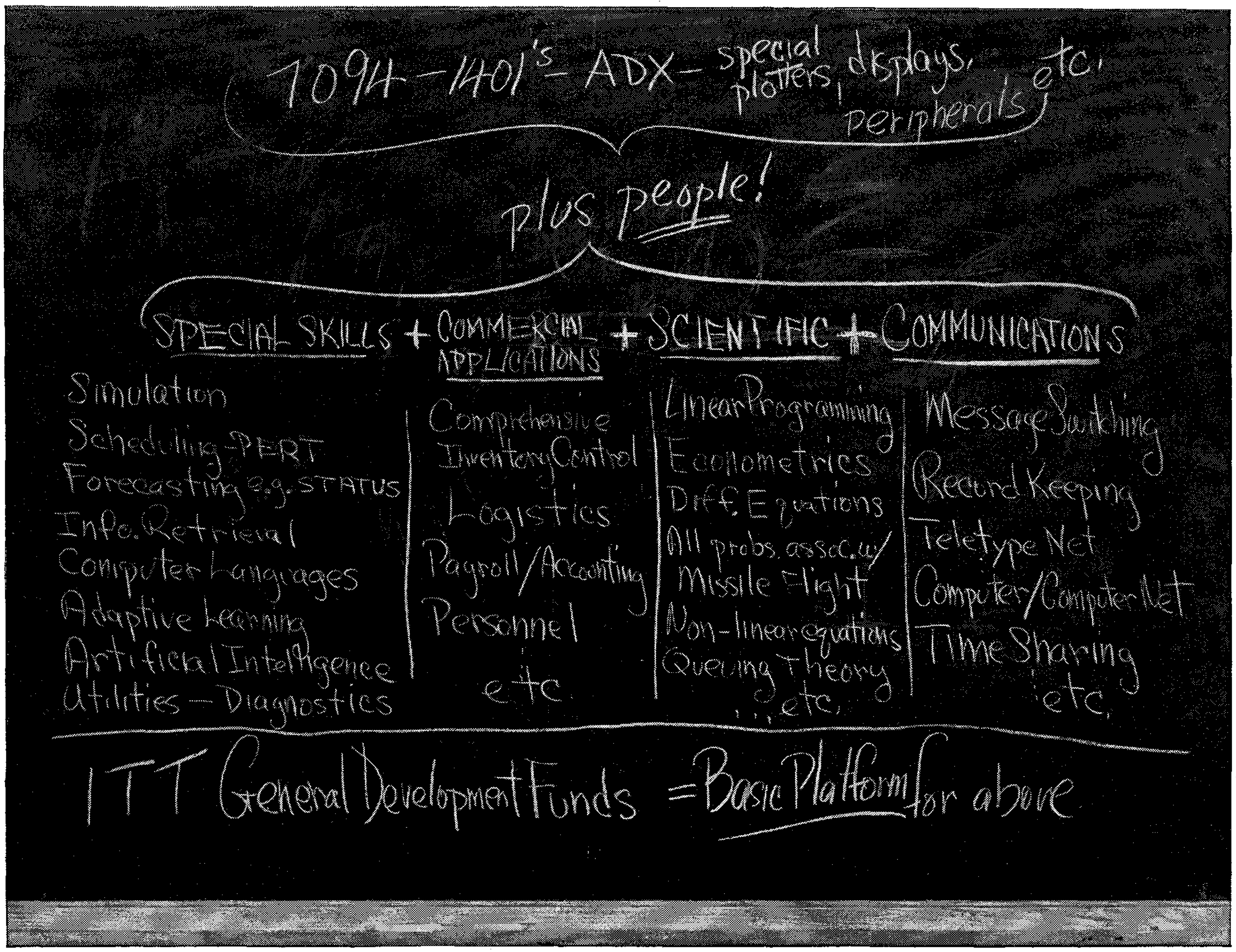
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ITT **DATA AND INFORMATION SYSTEMS DIVISION**

TRANSPHONEMATOR AN EDITORIAL BY JOHN W. CAMPBELL

In Dr. E. E. Smith's story, "Triplanetary," his human heroes are captured by the amphibian people of Nevia, and taken away in the Nevians FTL interstellar cruiser. A communication difficulty shows up, however; the Nevians speak—and hear—at a frequency range starting above the highest human vocal sounds, and their idea of a *basso profundo* is something too shrill for human hearing. To overcome this problem, the Nevian commander has a frequency converter device made up, so that the Nevian voice range is transformed into the human-hearing range, and human voices transformed up to the Nevian hearing range.

In H. Beam Piper's story, "Naudsonce," a different difficulty is encountered. The human viewpoint characters encounter a race on another planet which has a sensory mechanism that senses air-borne vibrations—but not in the way human ears do. Their analysis of sounds is so totally alien that they can't see similarity in sound patterns human ears consider identical, while they hear identities where we hear pure randomness.

Both authors, it turns out, are to be congratulated—but they went much too far. They needn't have gone further than the nearest ocean to encounter both problems in one, right here on Earth. The porpoises communicate with each other in a way that can only be described as speech; it is a sonic communication that is both descriptive and predictive, and is not a traditional-instinctive pattern of sounds. They use a frequency band from about 4,000 to about 50,000 cycles per second for speech—up to some 250,000 cycles per second for sonar ranging.

Not only is their speech at a frequency range human ears can't follow, —as E. E. Smith suggested for his Nevian amphibians—but, the problem Beam Piper suggested also exists; the porpoise ear-auditory-center-speech-center combination perceives sound-patterns in a manner distinctly different from that used by the human auditory-recognition centers. The analogy isn't exact, but it's useful to put it this way: If a standard broadcast set were fitted with a frequency converter, so it could tune in the 100 megacycle FM band, it would be able to pick up the signals of an FM station—but it still wouldn't be able to "understand" what the FM station was transmitting. The demodulator in a standard broadcast set can respond only to amplitude changes; an FM signal has no amplitude variations—only frequency changes.

A device that changes the porpoise language from its 4 to 50 kilocycle range down to say 4 to 50 hundred cycles could be made all right—but it wouldn't do human beings much good in learning to speak porpoisese.

Human speech modulation is an extremely tricky thing. It is *not* a matter of changes of pitch; if it were we couldn't sing songs with varying pitch, and still enunciate words clearly. It isn't amplitude modulation; if it were, what your friend was saying would change as you walked toward him, or away from him.

Sure—we produce varying frequencies, and varying loudness when we talk. But as Bell Laboratories and many another research group has found, speech is *not* adequately represented in terms of frequencies. Yes, you can, by using adequate filters, extract a lot of different frequencies from a human voice sound. You can also extract the same frequencies from the sounds made by air leaking out of a balloon.

We're consciously aware, by now, that human speech modulation is decidedly trickier than the mathematical analytical techniques so far used in trying to understand what it is.

Porpoise speech modulation is, seemingly, equally tricky—but just as different in its structure as FM and AM. And our auditory centers are simply not set up the way the porpoise's is, so even when we can hear the voice of a porpoise, we can't learn porpoisese.

Not being porpoises, we can't say for certain that the inverse applies, but it's pretty probable that a porpoise—who can hear nearly all the human vocal range; his hearing extends down below one hundred cycles—can't analyze human voice-modulation.

Now be it noted that while human auditory centers can analyze human voice modulations with great facility and rapidity, human brains, at the conscious level, had tried and not succeeded. Just as the stupidest baby can synthesize the most elaborate hormones, enzymes and proteins, while no biochemist can do so.

The effort to analyze human speech modulation has definitely been a major effort on the part of the Bell Laboratories over many years; they wanted to know more about it so they could handle voice communication better, more efficiently. Obviously, you can do a better job handling something if you know-understand what the thing you're handling is—how it works when it works right, and how to repair it if it gets damaged in transit. More recently, say the last thirty years, they've been trying to find a way to make a voice-operated dialing system.

IBM and other major computer outfits have also been trying to analyze human voice modulation; it would be nice if they could make a computer that you could speak to, and have it understand what your instructions were.

The problem is *not* easy—and any problem is made not only more difficult, but downright impossible if you approach it with the wrong theory.

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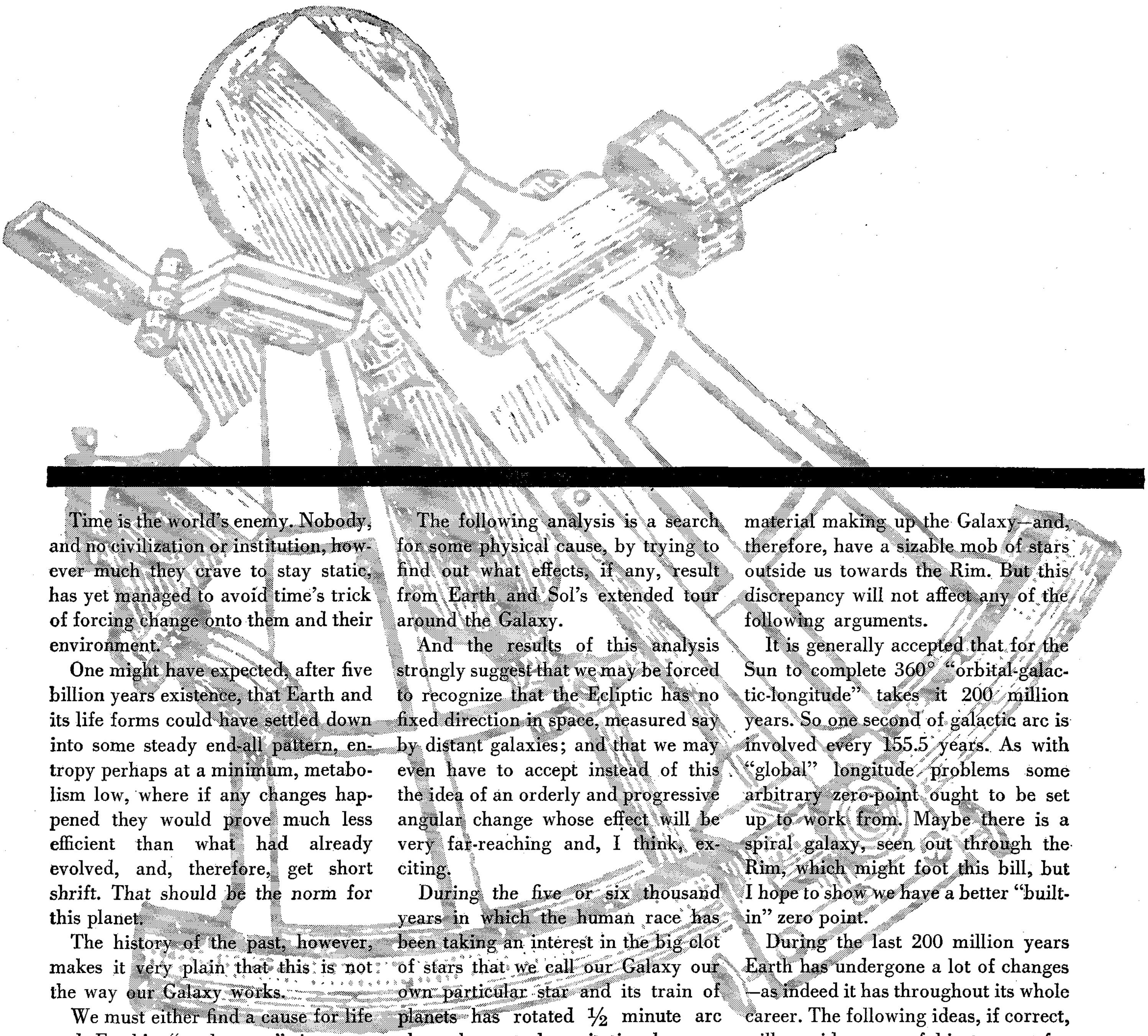


Time is the world's enemy. Nobody, and no civilization or institution, however much they crave to stay static, has yet managed to avoid time's trick of forcing change onto them and their environment.

One might have expected, after five billion years existence, that Earth and its life forms could have settled down into some steady end-all pattern, entropy perhaps at a minimum, metabolism low, where if any changes happened they would prove much less efficient than what had already evolved, and, therefore, get short shrift. That should be the norm for this planet.

The history of the past, however, makes it very plain that this is not the way our Galaxy works.

We must either find a cause for life and Earth's "restlessness" in some underlying physical cause, or accept some "vital principle" which presumably is demanding continual "improvement."

But the latter belief is simply an intellectual trap or dead-end. An acceptance of such an idea means that "giving-a-name" to a problem has got it licked. Sympathetic magic in the Twentieth Century!

The following analysis is a search for some physical cause, by trying to find out what effects, if any, result from Earth and Sol's extended tour around the Galaxy.

And the results of this analysis strongly suggest that we may be forced to recognize that the Ecliptic has no fixed direction in space, measured say by distant galaxies; and that we may even have to accept instead of this the idea of an orderly and progressive angular change whose effect will be very far-reaching and, I think, exciting.

During the five or six thousand years in which the human race has been taking an interest in the big clot of stars that we call our Galaxy our own particular star and its train of planets has rotated ½ minute arc about the central gravitational mass—or rather about the center of gravity of the whole mass.

Does this rotation introduce fresh factors? Or is this purely an academic point?

From our local point of view, the center of gravity of the Galaxy does not quite coincide with the center of the Nucleus, since we are immersed roughly one-third of the way-in in the material making up the Galaxy—and, therefore, have a sizable mob of stars outside us towards the Rim. But this discrepancy will not affect any of the following arguments.

It is generally accepted that for the Sun to complete 360° "orbital-galactic-longitude" takes it 200 million years. So one second of galactic arc is involved every 155.5 years. As with "global" longitude problems some arbitrary zero-point ought to be set up to work from. Maybe there is a spiral galaxy, seen out through the Rim, which might foot this bill, but I hope to show we have a better "built-in" zero point.

During the last 200 million years Earth has undergone a lot of changes—as indeed it has throughout its whole career. The following ideas, if correct, will provide a powerful instrument for us to investigate these past geologic ages and climates of our Earth and give us a clear picture both of the conditions then—which will be seen, I think, to vary rather more than has been supposed—and of a set of forces which look as though they are the underlying cause of mountain-building.

Incidentally, all theories about the

An English navigator,
Captain Kirton has done a lot of orienting by the stars.
And there's a peculiar thing about Earth's orientation in space:
Did you know Earth travels through space North-Pole-first?
And that the Moon's orbit is not concave toward the Earth?

THE PROBLEM OF THE GYROSCOPIC EARTH

J. P. KIRTON

latter always seem to me singularly lacking in charm. They never get around to showing us where the forces come from that are supposed to be doing all this work. And to me that seems the pith of the matter. I propose to reverse this and show where the force comes from, and leave the mechanism of its application on Earth's strata to the reader's working out.

I would be glad if I could go further and establish that this change in the Ecliptic is exactly in accordance with our angular movement in "orbital-galactic-longitude," for this would make calculations of the Ecliptic angle for any time in the past, or future, relatively simple. Yet the possible effects of unmapped magnetic fields which may be interlacing space have not so far been investigated. And since these may affect the orbits of planets circling their suns, as I hope to show shortly, things will not be as simple as I had at first hoped. Perhaps we can make a rough appraisal of these, however, and incorporate them in the argument.

Let us start with forces that are quite straightforward. It is usually reasonable—though sometimes risky—to extrapolate from the known to the unknown. We know analogy is a tricky thing to work with at the best of times, yet in this case analogy can be backed up I believe by at least two reasons "why" and "how." I admit that the forces I am going to put forward are small ones. But they do not need to be big! They have a long, long, while to act in!

Let us see what we can extract from analogy. First take the Moon/Earth/Sun system—a straightforward three-body problem. This system so far as human records go—and these involve at least five thousand revolutions around the Sun—appears to repeat itself with complete regularity.

In Figure 1a the Ecliptic lies in the plane of the paper. Figure 1b gives another view, this time with the Ecliptic shown roughly at right angles to the plane of the paper. All three bodies clearly lie in this one plane—except, if one is pernickety, for the Moon. This does show a small angular displacement from the ideal: to the tune of 5° 8'. That displacement would most probably not be there if we were dealing with perfect spheres.

There is little doubt that it is to be attributed to the shape of Mother-Earth, which is not a true sphere, and has—among other abnormalities—a matronly bulge around her middle for which the Moon itself is partly responsible owing to its gravitational attraction. Centrifugal force of the spinning Earth contributes also.

For this very reason it seems to me that no sputnik can ever settle down into any orbit other than an equatorial one—given sufficient time. Unless it has been put up with enormous accuracy into an exact polar orbit. Even then it would only be in a state of unstable equilibrium.

Figure 2 shows the forces, due to Earth's equatorial "bulge" which would prevent this. A sputnik is not sufficiently far off for us to consider the difference in the lengths of "x' and "y" to be negligible—Figure 2 is drawn to show them exaggerated. The sputnik, of course, is extremely close to Earth and of relatively small mass.

At positions "A" and "B" the major gravitational force operates from "O" —Earth's center of gravity—but taking the orbit as a whole the difference between the values of "x" and "y" introduces a couple tending to pull the orbiting body into the equatorial plane. In other words the closeness of the nearside "bulge" produces a greater attraction than the equal bulge on the far side of Earth.

The force is steady and progressive. It doesn't let up. Given sufficient time in which to act it must complete the job. It is probably this same force that causes the 5° odd nonalignment of the Moon. The latter having struck a balance between the Equator and the Ecliptic.

If one were dealing with a rigid disk surrounding Earth and rotating at the same speed as the sputnik, this disk would start "precessing" under these conditions, because of the necessity to preserve "angular momentum." But we are dealing here with a particle, and I cannot see that precession, as such, enters the problem of the *"orbit"* of any body at all. In the case of a stone on a string whirled round one's head, if the plane of this operation gets altered the stone moves into its new plane, but most certainly does not precess. It resists the change—but not by precessing!

A rigid body though, rotating on its own axis, is another kettle of fish. This distinction is important for a point which comes up later.

So a quick analogy from the Moon/Earth/Sun system suggests that any three-body system *may have a tendency for all three bodies to lie in one plane.* In the case of the E/M/Sun system this is the result found by observation. In the case of the sputnik, by analysis; for one is in fact regarding Earth/Earth-"bulge"/Sputnik as a three-body system which tends to line up in the one plane.

Now the Earth/Sun/Nucleus—i.e., center of gravity of Galaxy—system! Is this observed to follow the rule?

Figure 3 gives a plan view of the situation—in 1963. (The Ecliptic is the plane found by ignoring the 170 mile per second forward advance of Sol and the Solar system around the Galaxy. In the diagram it is "normal"—right angles to the paper.)

Earth's motion is actually a long attenuated spiral around Sol's track. The angle it makes with this is quite small—only 4°. In fact they are running almost parallel with one another. But for clearness the orbit has to be shown exaggerated in the figure.

(It is so small an angle that I personally wished to regard Sun and Earth as pursuing independent paths around the Nucleus as the first and most important factor in their common motion, and then to consider Sol's attraction as just another complication introduced by the proximity of the latter. But I have been slapped down so hard for this approach that I hesitate to bring it up again—though as the Immortal Marie Lloyd once said: "You can't stop a girl from thinking!"

It does not affect this present argument. But it might simplify the approach to other problems we shall run up against when the human race gets round to them—Galactic travel and Galactic navigation.)

In Figure 3 it is seen that the present Ecliptic passes through Sun and Earth—this, of course, by its very definition—but it also *passes through the center of the Galaxy!* Any star-map shows this—Ecliptic cutting through the Milky Way in Sagittarius.

It seems, therefore, that we have another case of three-bodies settling down into one plane under their mutual attractions! Obviously one cannot say whether they started off like this originally. Probability suggests they did not but that, *however they started off, they eventually sorted themselves out in this fashion.* From which it would seem likely that there is some force operating to bring them into alignment and returning them to alignment if they get temporarily out of it!

This is the analogy I spoke of. Dare we push it further?

Anyway, now for the one thousand dollar question! What happens to the Ecliptic when Sol and Earth get 90° or so farther round their Galactic track—in some 50 million years' time?

For if, as conventionally believed, the Ecliptic is fixed in space (judged

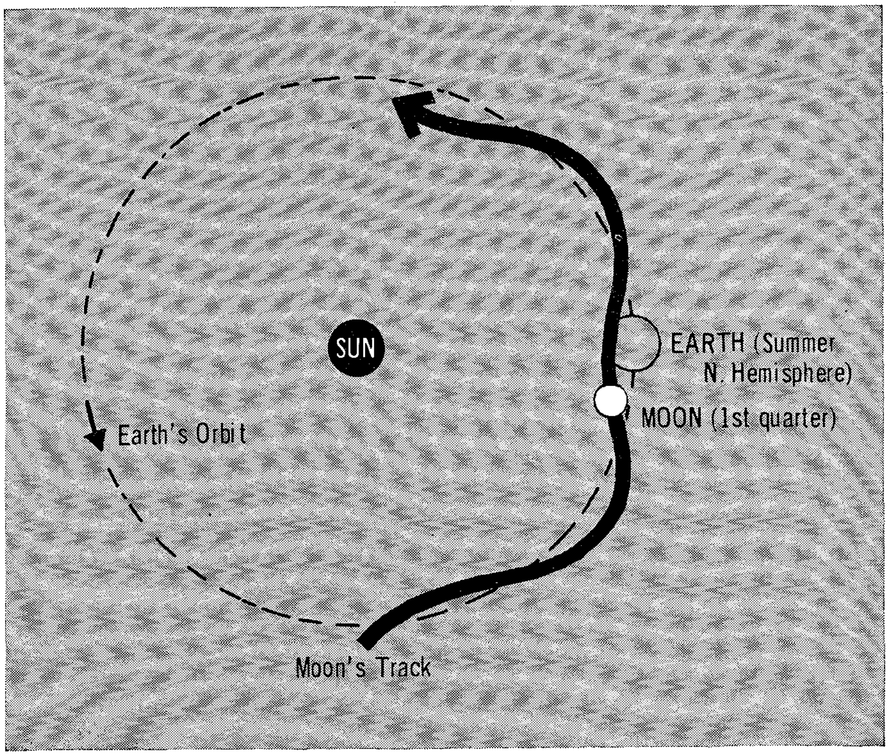


FIG. 1a. Plan View of three bodies: Sun: Moon: Earth. The Solar Year. The relative motion of these three bodies has continued in the one plane from time immemorial: the Ecliptic. In the case of the Moon the small angular difference (5° 8′) may, in fact, be due to the not-truly-spherical shape of the Earth?

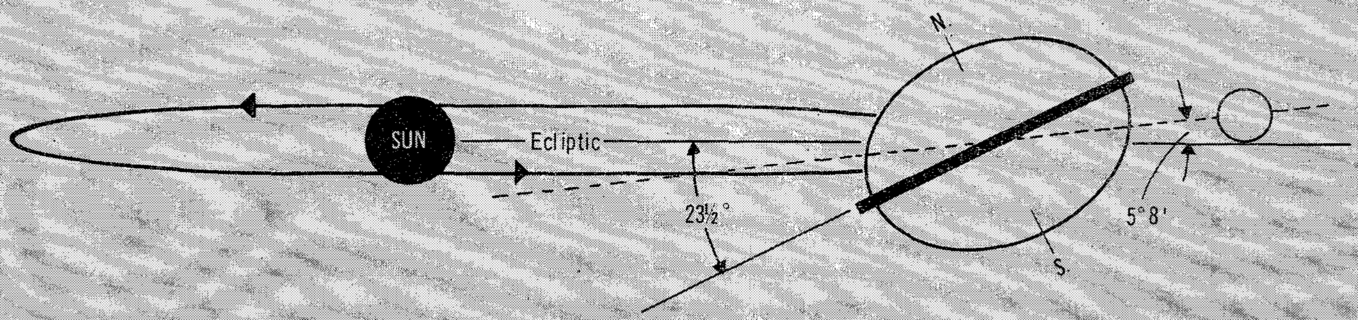

N.
SUN
Ecliptic
23½°
5°8'
S.

Fig. 1b. Elevation view of above: Sun; Moon; Earth. The 5° 8′ divergence from the common plane probably to be attributed to the irregular shape of Earth, which is not truly spherical.

Fig. 2. Effect of Earth's equatorial bulge on orbital plane of Moon. In the case of a "sputnik" not put into orbit exactly on a polar orbit I suggest that it will always tend (given sufficient time) to drift into an equatorial orbit. Due to the equatorial bulge (where this exists) of the mother planet.

At point (A) the attraction of the nearer "bulge" will be measurably greater than the attraction (at that moment) of the farther "bulge" (B).

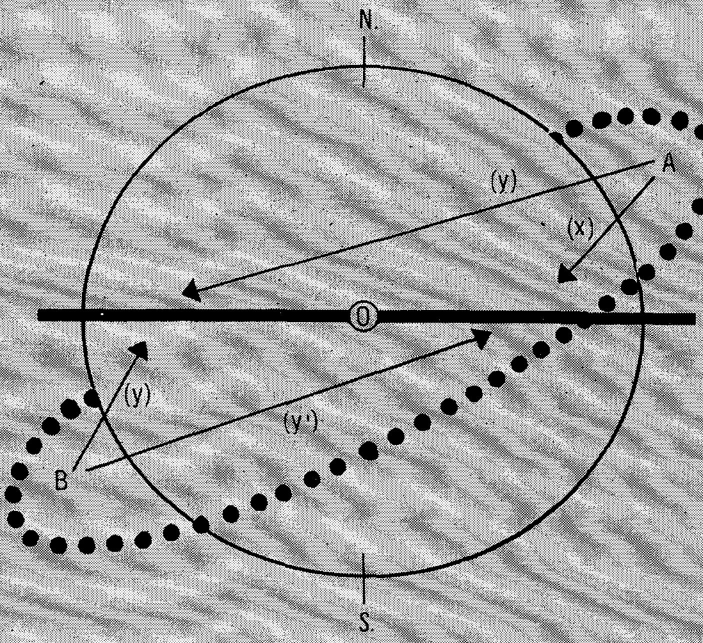
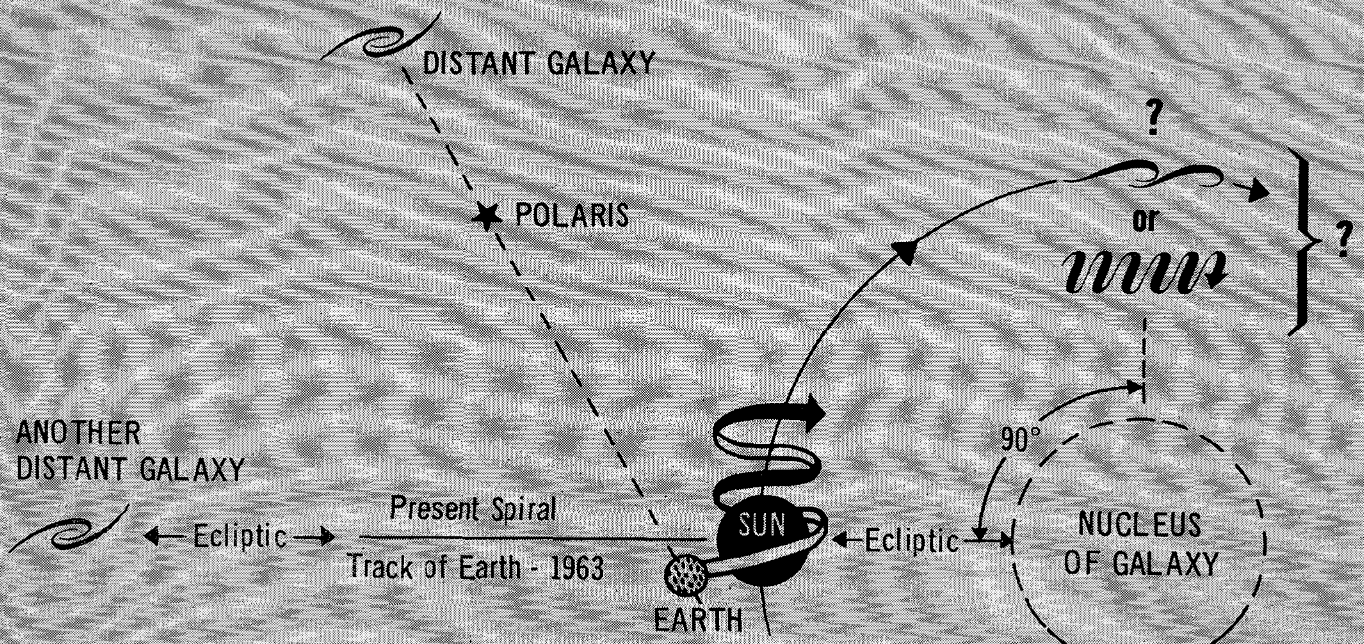


Fig. 3. Plan View of three gravitational centers: Nucleus; Sun; Earth. The Galactic Year.

The relative motion of these three centers has also continued in the one plane, (shown above) from time immemorial: since the Ecliptic cuts the Plane of the Galaxy at the "Sagittarius" area of the Milky Way. (Observed fact)


DISTANT GALAXY
?
POLARIS
or
?
ANOTHER DISTANT GALAXY
90°
Present Spiral
Ecliptic
Track of Earth - 1963
SUN
Ecliptic
NUCLEUS OF GALAXY
EARTH

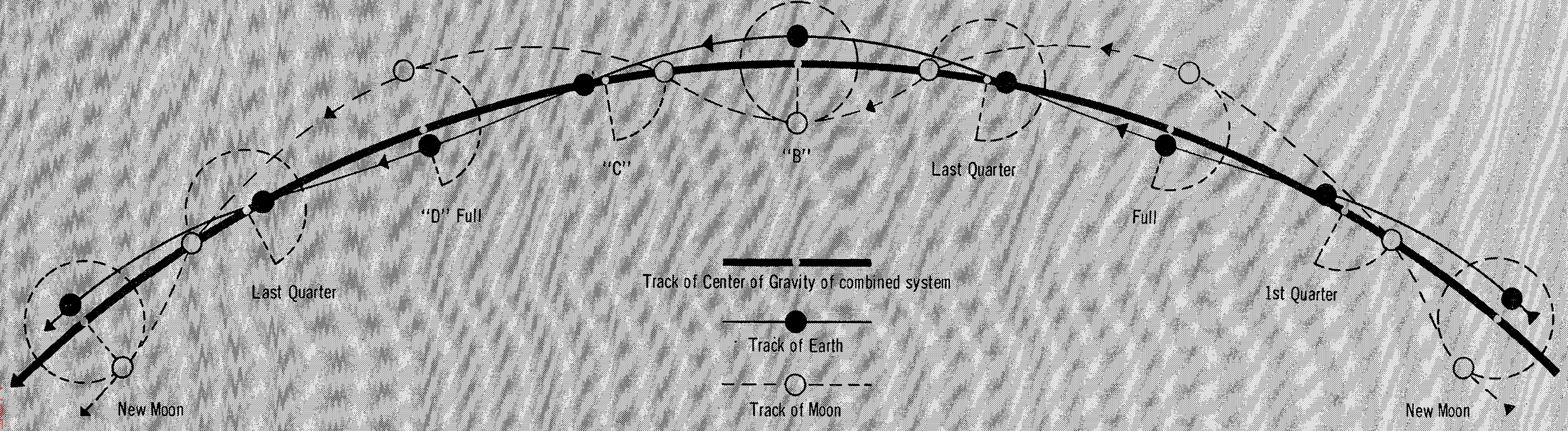

"C"
"B"
Last Quarter
"D" Full
Full
Last Quarter
1st Quarter
Track of Center of Gravity of combined system
Track of Earth
Track of Moon
New Moon
New Moon

Fig. 4. Orbits of Earth and Moon. Orbits exaggerated.

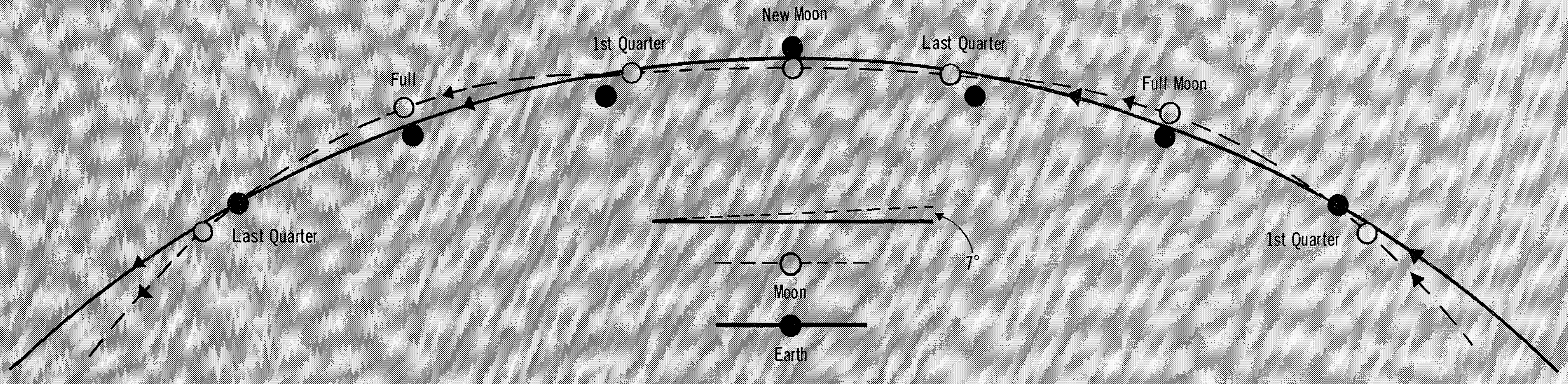
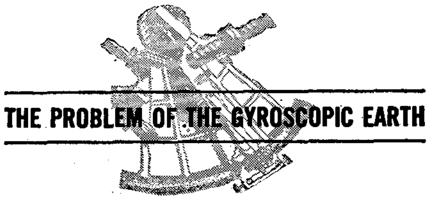

New Moon
1st Quarter
Last Quarter
Full
Full Moon
Last Quarter
1st Quarter
7°
Moon
Earth

Fig. 4a. Earth and Moon tracks drawn to scale.



THE PROBLEM OF THE GYROSCOPIC EARTH

by, say, a couple of distant galaxies a right angle apart—two lines being needed to fix a plane) then after 90° solar travel Earth's track can no longer be the simple helix around Sol's line of flight shown in Figure 3, since the Ecliptic, unless it has rotated too, would now be lying *in the plane of Solar motion.*

Maybe it is not impossible for Earth's orbit to lie in the plane of the Solar track as such. Certainly the Moon's motion lies in the plane of Earth's track. But there is one big difference—the Moon's orbital plane does not lie *at right angles to the plane containing the other two bodies!* It lies in the same plane. (Figures 1a and 1b).

It has been suggested to me that "preservation of angular momentum" compels the Ecliptic plane to keep its direction in space constant. And maybe it would, *unless we can find some other force which operates to prevent it.* But if the Ecliptic does *then* lie in the plane of Sol's forward motion, i.e., truly parallel to its present extension in space 1963, then *this* plane will no longer contain the Galactic Nucleus. The Nucleus will, in fact, be perpendicular to it. And this goes against our three-body analogy.

This would be odd for, if they will have ceased to lie in the one plane—when they get a further 90° around the track—then the human race just "happens to be here" in one of the two specially privileged positions in the whole, long, round where Ecliptic and Nucleus do lie in the one plane. The two spots are, of course, the one where we are now, and another diametrically opposite across the Galaxy.

This could be just a mark of appreciation to the human race for taking a bit of interest this last six thousand years or so. But I am somewhat leery about "specially privileged" ideas. I suspect we will find we have no privileges whatever in this man's (?) universe except, maybe, that enough clues have been left out for us so we can understand and organize our bit of space.

Odds of about 100,000,000-to-one-against are stacked against this "specially privileged" idea!

Therefore, if the Ecliptic must always contain the Nucleus in its plane, then 90° further round the Galactic Orbit, the Ecliptic will have to rotate 90°, too—by the same amount that the Sun will have changed its Galactic Orbital Longitude!

O.K.! So what?

Don't let us fool ourselves. This will have most exciting repercussions. For Earth's *poles* are locked in space, for here we are dealing with a *rigid rotating body.* Even if you could push one of the Poles over, the whole thing would just start to precess. Like a top —it would not just "lie down"! If the Ecliptic—Earth's Orbital Plane—has rotated 90° in 90° of Galactic travel, then at this point—± 23½° of course —Earth's poles will be getting presented to the Sun at the mid-summer of each hemisphere. Earth will be behaving *then* as Uranus behaves now. Undergoing a "Uranus" phase in fact, of which more anon.

Unless some other factor operates, *Earth's Declination at any moment of time also indicates our position in one of the four quadrants of Galactic Orbital Longitude.* It should supply us with a natural system of reference. This is really useful.

The argument so far has been purely from anology, supported by the laws of probability. Nothing, except the long odds, has been put forward yet to show that the human race is not in a "specially privileged" position. And acceptance of the latter view would naturally invalidate the argument given so far.

So is there any force that could act in the changed conditions 90° round the Galaxy, to account for a rotation of Earth's orbital plane? In spite of angular momentum?

I think one does emerge, from a study of Lunar Motion. In any diagram of this the forces involved are nicely laid out, rather like one of those "exploded" diagrams of engine-working parts in the technical journals. Here is one case which we can see for ourselves repeating itself month in and month out, and year after year. We don't need wait 50 million years for our answer.

Figure 4 shows the motion of the Moon in space relative to the Sun and the Earth from a vantage point somewhere above the Sun.

At point "A" the mutual attraction of the two bodies tends to slow down the Moon, since this is lying ahead of Earth at this point. Loss of speed in orbit causes any body, whether it is a shell fired from a gun, a sputnik, satellite or planet—or even a star in its galactic orbit—to fall in to a smaller orbit around the governing gravitational mass.

Then, as the Moon begins to lag behind Earth—from point "B" on through "C" to full moon—this effect is reversed and the Moon is accelerated and flies out, widening its orbit because of its increased centrifugal force.

The diagram is exaggerated, of course. The Moon's orbital distance is exaggerated in relation to the forward motion of the Moon/Earth system to show the forces involved. Drawn to proper scale, as in Figure 4a some odd facts emerge. The Moon's track remains always CONCAVE to the Sun. Its track is an extraordinarily smooth one around the Sun. Deviations from a clean ellipse due to the mass of Earth nearby are unexpectedly small, compared with the rest of the motion. And the Sun's gravitational field looks overwhelmingly master!

The Sun, 372 times further off—and gravity falling off, too, as the square of the distance—still has an overriding effect. The mere 1° angle between the paths of Earth and Moon confirms this. The angles can be obtained from the formula:

$$\frac{\textit{Twice Moon's Orbital distance}}{\tfrac{1}{2}\ \textit{Moon's travel per lunar month}} =$$

$$\frac{2\,(238{,}860)}{\tfrac{1}{2}\left(\frac{1}{13}\times\frac{44}{7}\times 93\times 10^{6}\right)} = \tan\Theta$$

$$\Theta = \text{angle between tracks} = 1°$$

Just as the Sun, and NOT the Earth, of the Moon, is it possible that we have underestimated the effect of the Nucleus' attraction on Earth in our investigation of planetary orbits?

Is there any differential effect due to this which might orient the Ecliptic in any particular way?

The Earth's rotation around the Sun, however, is not quite as simple as the Moon's motion around Earth, for it has a helical flight-path and would need a 3-D drawing to do it justice. But Figure 5 on the plane of the mid-line through the Galaxy from Rim to Nucleus, shows the force that I believe maintains Earth's orbit so that its plane *always cuts the Nucleus.*

The forces "x" and "y" are not equal. During travel between "A" and "B" should the Ecliptic—and, therefore, Earth—get out of line with the Galactic C of G. then the fractionally greater force "x" must draw Earth towards the Nucleus at the peri-Nucleus point, and so straighten out the orbit, or rather re-align it—somewhat like the bulge of Earth must affect a sputnik. Admittedly this force may be a small one. Merely the difference between "x" and "y". But it has a very long while in which to operate. And *it only has to produce a change of 1 sec. of arc in 155.5 years to keep Earth's orbit lined up nicely.!*

There is plenty of time. It can take 50 million years producing 90° of change and, geologically speaking, this is a sizable chunk even in the life-history of a mountain range! Or in the life-history of biological genera. Or, cosmologically speaking, even in the life-history of some stars.

It has been put to me that, when it is worked out, the attraction of the central regions of the Galaxy at Sol's distance out from the center is extremely minute. This begs the question. For the Sun's attraction, 93 million miles off where Earth and Moon are locking gravitational horns, should be relatively small, too! But that small angle of 1° suggests that the main central body does have disproportionate effect.

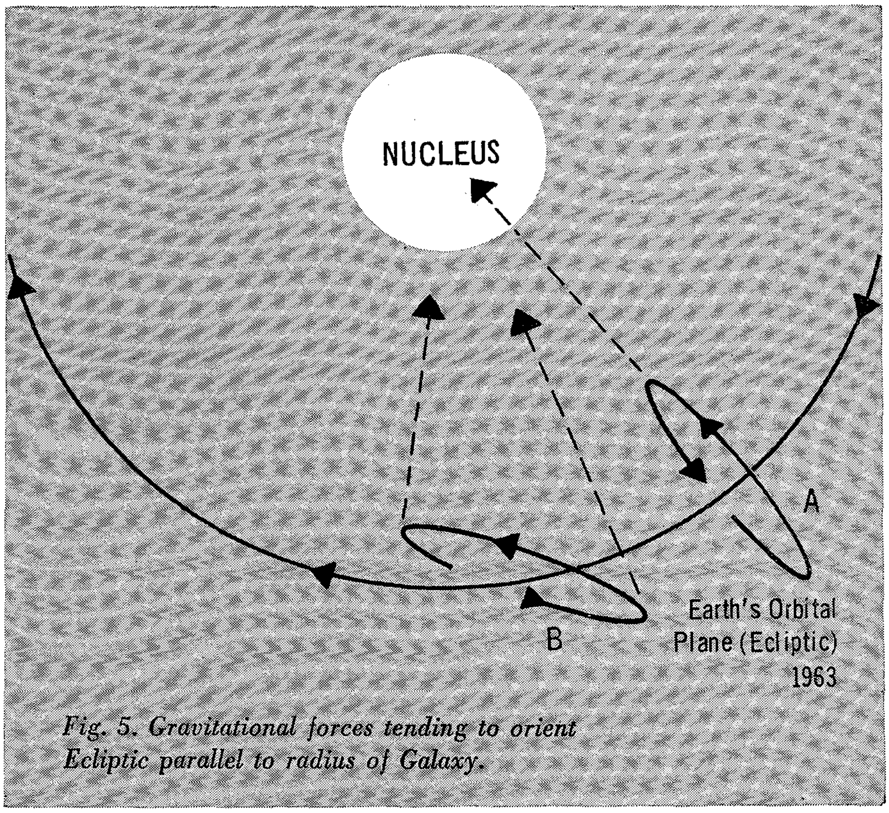


Fig. 5. Gravitational forces tending to orient Ecliptic parallel to radius of Galaxy.

And however small one convinces oneself that the pull of the Nucleus is, this attraction from the center of gravity of the Galaxy is powerful enough to lock the stellar mass of the Sun and all its attendant planets into a Galactic orbit.

Were we to agree that the Nucleus' attraction is insufficient for this, we should merely have to go further and postulate some other force, maybe of a different nature, that is doing the job.

Unless of course, one is prepared to accept that Sol is a rover and goes where it chooses?

Well. That is *the question!*

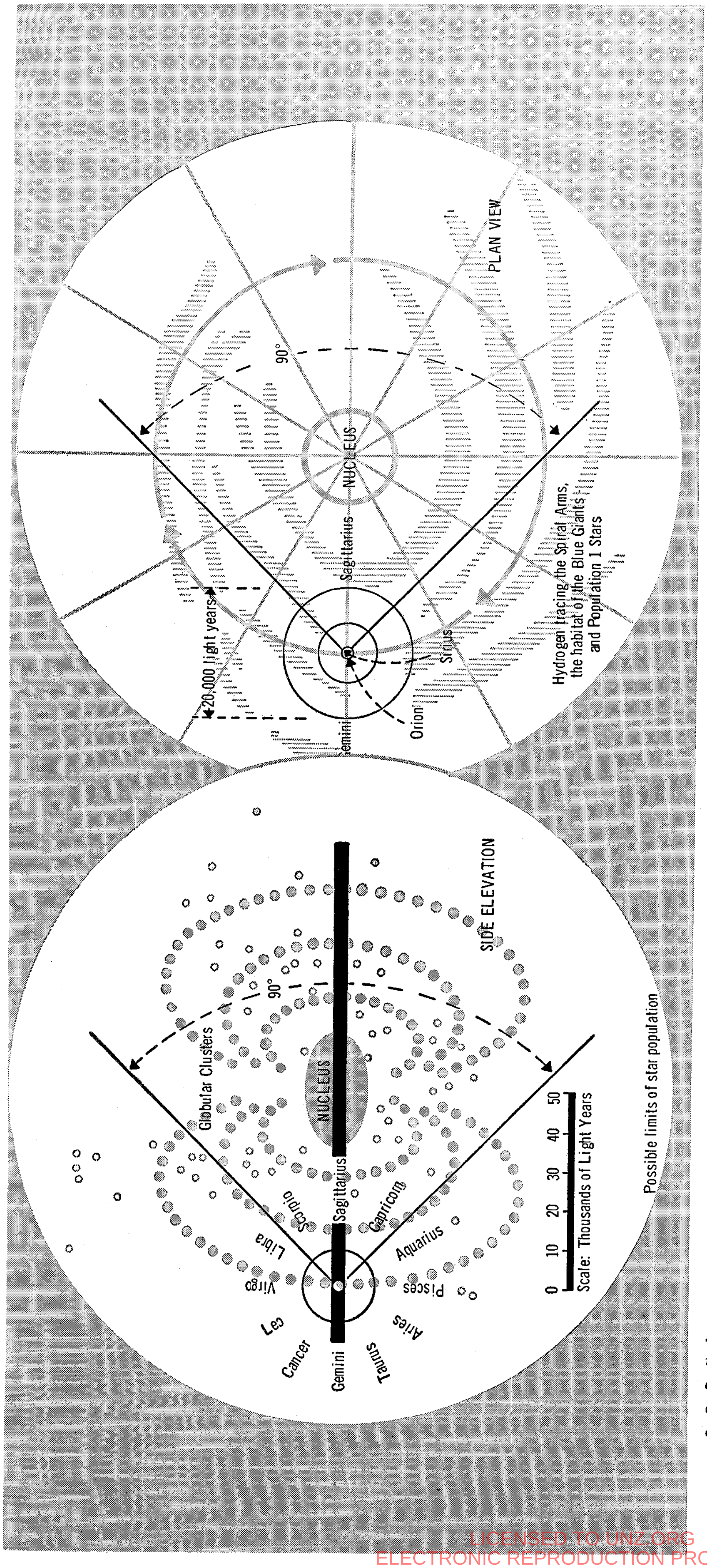
In fairness I believe that the gravitational force could be supplemented —or diminished—temporarily by the Sun's situation in relation to the Local Cluster—if it turns out to be in orbit around this. Or, maybe, Sol executes an orbit also around the nearest knot-in-one-of-the-spiral-arms? But neither of these possibilities would affect any long term calculation, since the pluses and the minuses would, of course, cancel out.

The fact that we are, so far as we can tell, correctly in line with the Nucleus of our Galaxy (as of 1963) is a strong indication that we do tend to line up with it at all times—though possibly we wobble a bit each side of the mean position.

To return to the hint above: That there might be another force as powerful as gravity which could pull the Ecliptic round so that the Nucleus always stayed in its plane. There is the possibility of an overriding Magnetic Field.

If there should be an identifiable Galactic Magnetic Field then there might be two outlooks on this:

1. The field might well be only the summation of all the fields of all the stellar population;
2. The motion of the various stellar bodies through any built-up field might induce electric currents and therefore fresh magnetic fields building up themselves, probably in opposition to the existing field.


PLAN VIEW
NUCLEUS
90°
Sagittarius
Sirius
Orion
Gemini
20,000 light years
Hydrogen tracing the Spiral Arms, the habitat of the Blue Giants and Population 1 Stars
SIDE ELEVATION
NUCLEUS
90°
Globular Clusters
Sagittarius
Scorpio
Libra
Virgo
Leo
Cancer
Gemini
Taurus
Aries
Pisces
Aquarius
Capricorn
Scale: Thousands of Light Years
0
10
20
30
40
50
Possible limits of star population

(The underlying suggestion here is that the field might periodically reverse its polarity?)

Be this as it may, one can hardly go wrong in assuming that if there is some structure of Galactic-Magnetic nature, some overriding shape of field loosely embracing the whole collection of stars in our Galaxy, that it will be at least approximately symmetrical in some one plane?

Which plane? Unfortunately this is pure speculation, but taking the analogy of a planet's magnetism we might be led to suppose that it looks something like Figure 6. One has to assume that in some way rotation of the components will be intimately connected with the axis of the magnetic poles. And that the direction of rotation controls the polarity.

In such a field—if it exists—what forces would operate on a body moving in circular or elliptical paths?

Obviously this will depend on the *plane of their path.* The forces will be at a maximum if the path is cutting lines of force; and at a minimum, or zero, if it lies along them. There is an old rule in dealing with induced currents in dynamos which says that the induced current is always in a direction to oppose motion!

So since Earth's orbit at the present moment seems to be lying along Galactic lines of force (Fig. 6a and 6b) which radiate outwards from the center of the Galaxy, then these will certainly start up into action immediately if Earth's orbit (the Ecliptic—by definition) gets out of line; that is in any other direction than along *a radius of the Galaxy.* Hence, if it doesn't keep up with the change of direction of the new radius, it may be

FIG. 6. Bulk of galaxy is clearly attracting Earth and Sun. The loss due outwards-pull of the Rim probably no more than 5% as main mass is in Nucleus. N.B. (a) Both Sol and Sirius are contained within dot which shows sun's position above. (b) Orion is within the smaller circle. (c) Intermediate circle embraces everything seen of galaxy except the very brightest objects.

taken by the scruff of the neck and pulled round.

In other words the Ecliptic must rotate 360° during a complete Galactic tour. Figure 7 may make this argument plainer.

At point "A" (1963) Earth's orbit does lie along these imagined lines of force, and so no force is being exerted to alter it. But, after traveling along the Galactic track, it will reach position "B" where, unless the orbit has rotated somewhat so that it can still face the center of the Galaxy, Earth will have begun cutting lines of force, and a force will be induced at once to resist this.

Earth's orbital movement as such gets no check. Only the tendency to get out of line with the radius of the Galaxy does.

This arrangement involves the tacit assumption that the Galaxy's field is rotating at the same rate as the Sun moves in its Galactic orbit. Since *every* star's Galactic-orbital-speed is a function of its own distance out from the center, the magnetic fields must be very much more complicated than has been sketched here—if they exist, of course.

Were we dealing with a fixed field in space, or one that rotated at a different speed from that of the Sun's orbital speed, the Ecliptic would certainly always be cutting galactic lines of force to some extent. Still a differential effect must be produced when greater angularity occurred owing to any further inclination of Earth's orbital plane.

Possibly a mean would be established between gravitational forces and magnetic forces. Since both act out from the center of mass the net result would be to line up the orbit at least approximately in line with the Nucleus. *Perfect alignment with the dead center of the Galaxy is not necessary for the argument,* which only seeks to prove that the plane of the Ecliptic is a matter of balance between opposing forces. Should these change, so will the plane of the Ecliptic. To accept the latter as an invariant demands that at all times and places these forces will be in absolute and precise balance as they now are.

This seems to be stretching likelihood to the limit, or beyond. A glance at the geologic record indicates that Earth has had a most checkered career: the turmoil of the strata, the seeming-pulse beating slow in the development of the life forms, as far back as the record goes. All this can be rationalized once it is accepted that the Ecliptic Plane it not rigidly fixed in space, but probably points towards the center of the Galaxy and contains the Nucleus.

Unfortunately I do not know how much work has been done on "particles" moving in magnetic fields or even, to be frank, whether any forces so produced on our planet might not be dissipated as hysteresis in the iron core of Earth. For that matter whether the mass of small particles floating at various rates in the Ecliptic at Earth's radius from the Sun—the Gegenschein—may not make up a whole, a sort of super-flexible disk, incorporating Earth. Though I should imagine that the electrical resistance in such a unit would be excessive even in vacuo. Still the force required is not a great one. All that is required is that it shall be persistent.

At any rate, if the Ecliptic varies, then the Sun's Declination is not always a constant 23½° N and S. of the equator, as at present. And at certain periods, twice during the galactic tour, its Declination can, and probably will, rise to 90° N and S. of the equator!

Earth will then be experiencing her "Uranus" Phase, with all its consequent effects on climate, and on the animal population of the globe, even to the point of extermination of species that have got themselves too nicely and comfortably adjusted to the old *status quo!*

If the poles, and necessarily the

Continued on Page 81

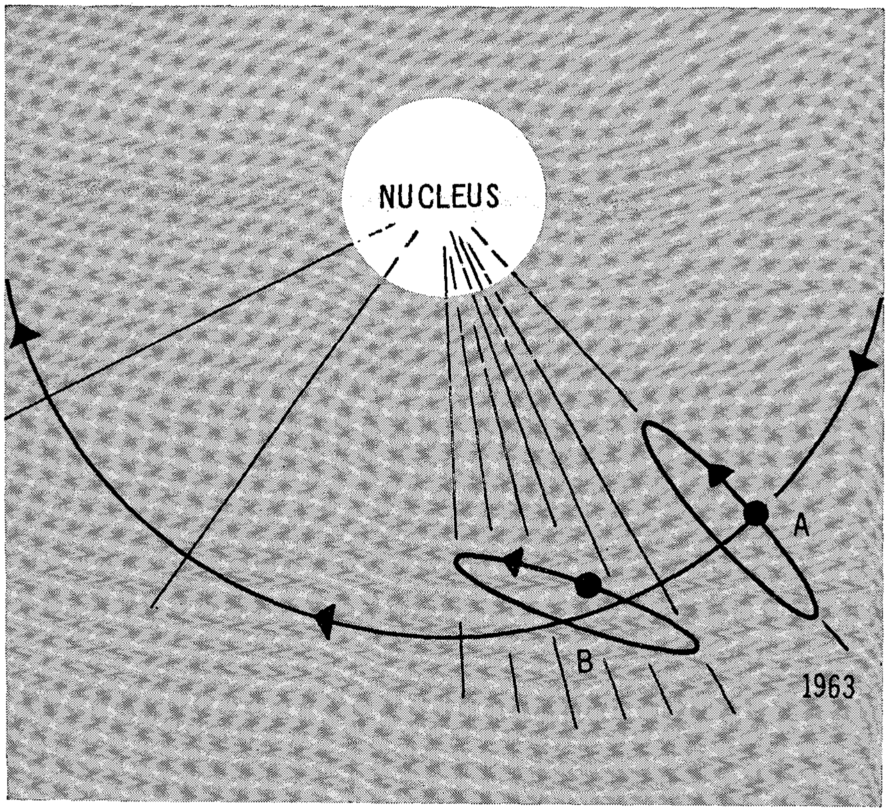


FIG. 7. Motion at A in line with lines of force of magnetic field. Motion at B cutting lines of force unless Ecliptic rotates by an equal angle to Sol's galac-travel.

Undercurrents

JAMES H. SCHMITZ

First of Two Parts.
Telzey didn't know about the Agency—
but they knew about her.
And Telzey found out the hard way—
which, for a telepath,
can be both hard and complicated!

I

At the Orado City Space Terminal, the Customs and Public Health machine was smoothly checking through passengers disembarking from a liner from Jontarou. A psionic computer of awesome dimensions, the machine formed one side of a great hall along which the stream of travelers moved towards the city exits and their previously cleared luggage. Unseen behind the base of the wall—armored, as were the housings of all Federation psionic machines in public use—its technicians sat in rows of cubicles, eyes fixed on dials and indicators, hands ready to throw pinpointing switches at the quiver of a blip.

The computer's sensors were simultaneously searching for contraband and dutiable articles, and confirming the medical clearance given passengers before an interstellar ship reached Orado's atmosphere. Suggestions of inimical or unregistered organisms, dormant or active, would be a signal to quarantine attendants at the end of the slideways to shepherd somebody politely to a detention ward for further examination. Customs agents were waiting for the other type of signal.

It was a dependable, unobtrusive procedure, causing no unnecessary inconvenience or delay, and so generally established now at major spaceports in the Federation of the Hub that sophisticated travelers simply took it for granted. However, the machine had features of which neither Customs nor Health were aware. In a room across the spaceport, two men sat watchfully before another set of instruments connected to the computer's scanners. Above these instruments was a wide teleview of the Customs hall. Nothing appeared to be happening in the room until approximately a third of the passengers from Jontarou had moved through the computer's field. Then the instruments were suddenly active, and a personality identification chart popped out of a table slot before the man on the left.

He glanced at the chart, said, "Telzey Amberdon. It's our pigeon. Fix on her!"

The man on the right grunted, eyes on the screen where the teleview pickup had shifted abruptly to a point a few yards ahead of and above a girl who had just walked into the hall. Smartly dressed and carrying a small handbag, she was a slim and dewy teen-ager, tanned, blue-eyed, and brown-haired. As the pickup began to move along the slideway with her, the man on the right closed a switch, placed his hand on a plunger.

Simultaneously, two things occurred in the hall. Along the ceiling a string of nearly microscopic ports opened, extruding needle paralyzers pointed at the girl; and one of the floating ambulances moored tactfully out of sight near the exits rose, shifted forward twenty feet and stopped again. If the girl collapsed, she would be on her way out of the hall in a matter of seconds, the event almost unnoticed except by the passengers nearest her.

"If you want her, we have her," said the man on the right.

"We'll see." The first observer slipped the identification chart into one of his instruments, and slowly depressed a calibrated stud, watching the girl's face in the teleview.

Surprise briefly widened her eyes; then her expression changed to sharp interest. After a moment, the observer experienced a sense of question in himself, an alert, searching feeling.

Words abruptly formed in his mind.

"Is somebody there? Did somebody speak just now?"

The man on the right grinned.

"A lamb!"

"Maybe." The first observer looked thoughtful. "Don't relax just yet. The response was Class Two."

He waited while the sense of question lingered, strengthened for a few seconds, then faded. He selected a second stud on the instrument, edged it down.

This time, the girl's mobile features showed no reaction, and nothing touched his mind. The observer shifted his eyes to a dial pointer, upright and unmoving before him, watched it while a minute ticked past, released the stud. Sliding the identification pattern chart out of the instrument, he checked over the new factors coded into it, and returned it to the table slot.

Forty-two miles off in Orado City, in the headquarters complex of the Federation's Psychology Service, another slot opened, and the chart slid out on a desk. Somebody picked it up.

"Hooked and tagged and never knew it," the first observer was remarking. "You can call off the fix." He reached for a cigarette, added, "Fifteen years old. She was spotted—actually she revealed herself—for the first time two weeks ago . . ."

In the Customs hall the tiny ports along the ceiling sealed themselves and the waiting ambulance slid slowly back to its mooring points.

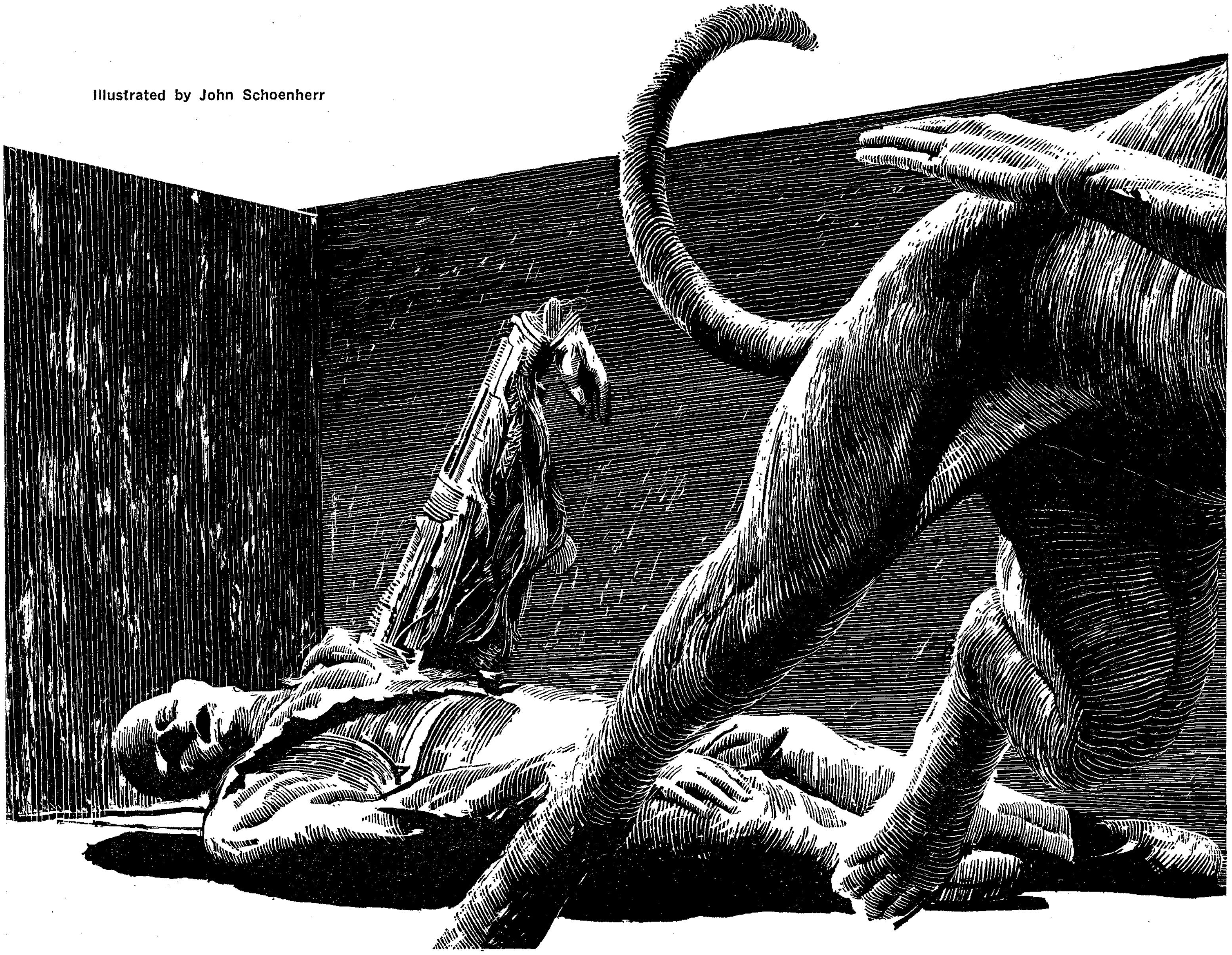
The visiting high Federation official was speaking in guardedly even tones.

"I, as has everyone else," he said, "have been led to believe that the inspection machines provided by the Psychology Service for Health and Customs respected the anonymity of the public."

He paused. "Obviously, this can't be reconciled with the ability—displayed just now—of identifying individuals by their coded charts!"

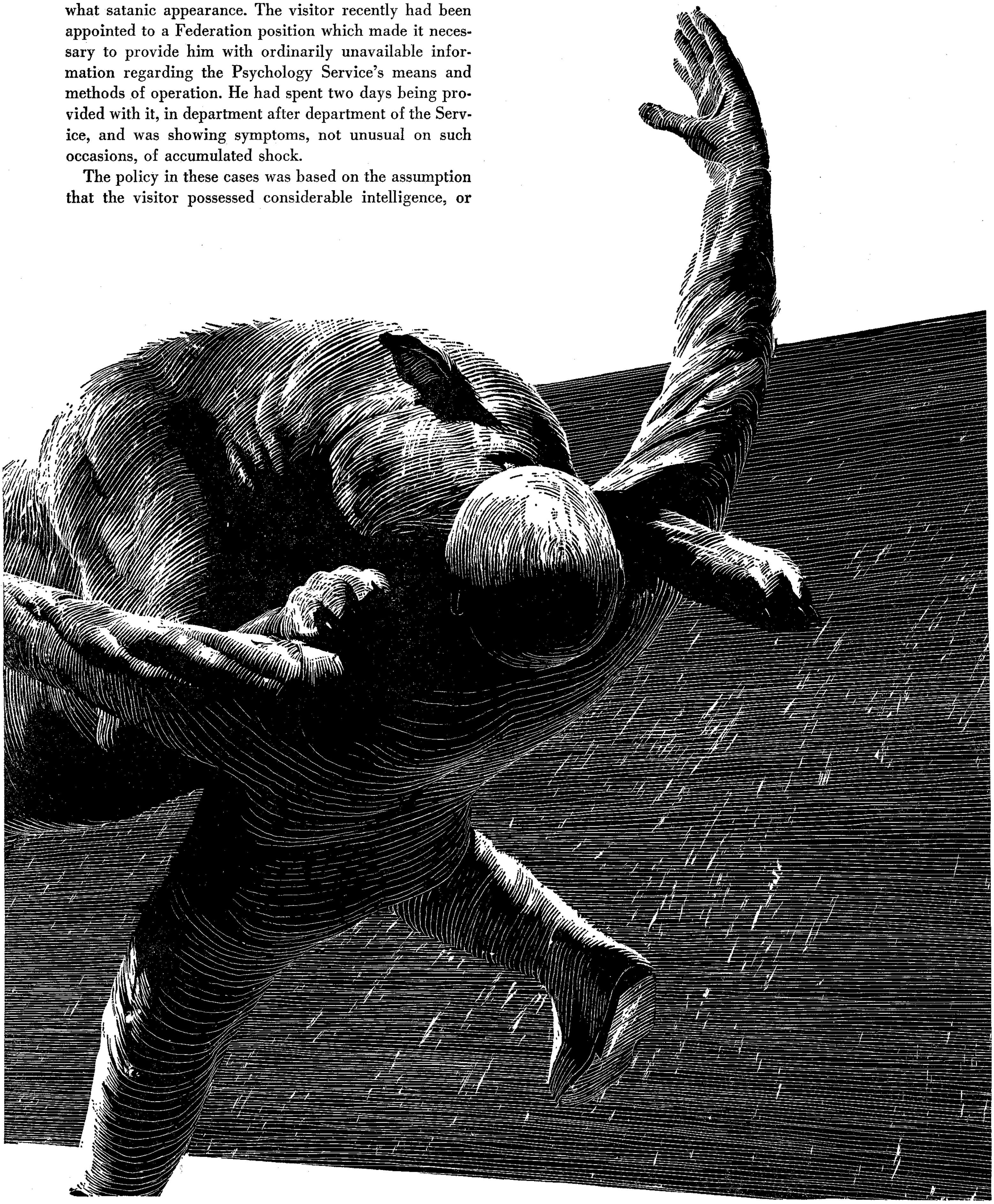
Boddo, director of the Psychology Service's Department Eighty-four, laid the identification chart marked with the name of Telzey Amberdon down before him. He

Illustrated by John Schoenherr



looked at it for a moment without speaking, his long, bony face and slanted thick brows giving him a somewhat satanic appearance. The visitor recently had been appointed to a Federation position which made it necessary to provide him with ordinarily unavailable information regarding the Psychology Service's means and methods of operation. He had spent two days being provided with it, in department after department of the Service, and was showing symptoms, not unusual on such occasions, of accumulated shock.

The policy in these cases was based on the assumption that the visitor possessed considerable intelligence, or



he would not have been there. He should be given ample time to work out the shock and revise various established opinions. If he failed to do this, his mind would be delicately doctored before he left Headquarters, with the result that he would forget most of what he had learned and presently discover good reasons for taking another job—specifically one which did not involve intimate contacts with the Psychology Service.

Boddo, not an unkind man, decided to do what he could to help this unwitting probationer over the hump.

"The Customs computer isn't supposed to be able to identify individuals," he agreed. "But I believe you already know that many of the psionic machines we put out aren't limited to the obvious functions they perform."

"Yes, I have learned that! I understand, of course, that complete candor can't always be demanded of a government agency." With an impatient wave of his arm, the visitor indicated the one-way screen through which they had looked in on the room at the spaceport. "But this is deliberate, planned deception! And more than that. If I understood correctly what happened just now, the so-called Customs machine—supposedly there simply to expedite traffic and safeguard the health of this world—not only identifies unsuspecting persons for you but actually reads their minds!"

"The last to a rather limited extent," Boddo said. "It's far from being the best all-around device for that purpose."

"Be that as it may! The presence of such a machine at the spaceport constitutes a violation of the public's right to privacy of thought."

"Of course, it does," Boddo said. "In practice a vanishingly small fraction of the public is affected. I couldn't care less about having the thoughts of the average man or woman invaded; and if I wanted to, I wouldn't have the time. Department Eighty-four is the branch of the Service's intelligence which investigates, registers, records and reports on psis, and real or apparent psionic manifestations outside the Service. This office co-ordinates such information. We aren't interested in anything else."

The visitor stared at him, face flushed, scowling undecidedly. It would be best to have him let off a little more steam before taking up the business for which he had been sent here. "I imagine," Boddo suggested, "you've been told of the overall program to have advanced psionic machines in general use throughout the Hub in the not too distant future?"

The official reddened further. "A monstrously expensive and wasteful project, sir! But that isn't my concern. What appalls me are the dangers to the public that are inherent in such a plan."

Boddo thoughtfully cleared his throat.

"The clandestine uses to which these machines are being put today," the visitor went on, "certainly are undesirable enough. The fact that this practice apparently is condoned at the highest levels of Federation government does not make it any less disturbing! To the contrary. What is to insure that the further spread of your devices won't lead to the transformation of the Federation into a police state with an utterly unbreakable hold on the minds of the population? The temptation . . . the possibility . . . will always be there."

Boddo began, "I believe—"

The official stabbed an accusing finger at him.

"But if that does *not* happen," he said, "if instead the reckless plan to turn these instruments over in great numbers—and within a few decades—to virtually anyone who happens to want them actually is carried out, the situation will be as bad, or worse. Inevitably, the machines will multiply the tremendous problems already presented by organized crime, by power politics, by greed, stupidity and ignorance. Our civilization, sir, simply has not matured to the point where powers of that nature should be entrusted to it! The most disastrous abuses must follow as a matter of course."

"Well," Boddo said, "you realize I'm not a policy maker. I'm not really qualified to argue such questions with you. Of course, the fact that the program has, as you remarked, the approval of the highest level of Federation government indicates that the reasoning behind it isn't entirely unsound. As I've understood it, the gradual, orderly introduction of psionic machines is expected to solve the problems you've mentioned progressively as the program unfolds. When you have the complete picture on that, you may find your opinions changing."

The visitor's mouth tightened.

"The functions of a number of the Service's other departments already have been explained to me," he remarked. "I've heard nothing so far to cause me to change my opinion. As for your own office—the control of the so-called human psis—I may as well tell you frankly what I think of it."

"Please do," Boddo said.

The official smiled coldly. "You're engaged in a witch hunt, my dear sir! Psionics is a sensitive subject nowadays. I'm not uninformed about the potentialities of dowsers, professional mind readers, fortunetellers, and the like. Their tricks are interesting, and may be useful, but have no real significance. However, a clever campaign to divert the public's concern to such people might very well leave the psionic *machines* looking very innocuous by comparison."

"Hm-m-m . . ." Boddo pursed his lips, frowning. "As it happens," he observed, "the purpose of this office is almost the reverse of what you suggest."

"I don't follow that," the visitor said shortly.

Boddo said, "You are not in possession of sufficient facts in that area. That, of course, is why you're here at the moment. I'm to supply you with facts. And to start with, I'll say that the last thing in the world we'd want is to bring the information this office gathers to the public's attention. The Service, of course, is conducting a continuous campaign on many fronts to reduce uneasiness and hostility about psionic machines. *Our* specific assignment is to prevent occurrences—arising from the activities of human psis—which might strengthen that feeling. Or, if they can't be prevented, to provide harmless explanations for them, and to make sure they aren't repeated—at least not by the psi in question."

The official scowled. "I still don't see . . . What occurrences?"

"We are not," Boddo said patiently, "in the least worried about what dowsers, professional mind readers and fortunetellers might do. Not at all. The public's familiar with them and regards them on the whole as harmlessly freakish. When the performance of such a person is sufficiently dependable, we call him or her a Class One psi. Class One falls into rather neat categories—eighteen, to be exact—and functions in a stereotyped manner. The Class One, in fact, is almost defined by his limitations."

"Then . . ."

"Yes," Boddo said, "there's another type. The Class Two. A rare bird, as he apparently always has been. But recent breakthrough in psionic theory and practice make it easier to identify him. We feel that the most desirable place for a Class Two at present is in the Psychology Service. I'll introduce you presently to a few of them."

"I . . . what kind of people are they?"

Boddo shrugged. "Not too remarkable—except for their talents. If you met the average Class Two, you'd see a normal, perhaps somewhat unusually healthy human being. As for the talents, anything a Class One can do, the Class Two who has developed the same line does better; and he's almost never restricted to a specialty, or even to two or three specialties. In that respect, his talent corresponds more closely to normal human faculties and acquired skills. It can be explored, directed, trained and developed."

"Developed to what extent?" the official asked.

"It depends on the individual. You mentioned mind reading. In the Class Two who has the faculty it may appear as anything from a Class One's general impressions or sensing of scattered specific details on up. Up to the almost literal reading of minds." Boddo looked thoughtfully at the visitor. "A very few can tell what's passing through any mind they direct their attention on as readily and accurately as if they were reading a tape. The existence of such people is one of the things we prefer not to have publicized at present. It might produce unfavorable reactions."

Doubt and uneasiness were showing in the visitor's face. "That would not be surprising. Such abnormal powers leave the ordinary man at a severe disadvantage."

"True enough," Boddo said. "But the ordinary man is under a similar disadvantage whenever he confronts someone who is considerably more intelligent or more experienced than himself, or who simply points a gun at him. And he's much more likely to run into difficulties like that. It's extremely improbable that he would come to the attention of a capable Class Two mind reader even once in his lifetime. If he did, the probability is again that the mind reader would have no interest in him. But if he did happen to take an interest in our ordinary man, there's still no reason to assume it would be for any malevolent purpose."

The visitor cleared his throat. "But there are criminal psis?"

"Of course there are," Boddo said. "As a group, they show all normal human motivations, including the criminal ones. The Class Two tends to be a rather well-balanced individual, but we have compiled a sizable list of those who put their abilities to criminal use."

"And your office takes steps to protect the public against them?"

Boddo shook his head.

"Don't misunderstand me," he said. "It isn't my business to look out for the public. I believe you know that the only category of crimes with which the Psychology Service concerns itself directly are those against the Federation or against humanity. That applies also where psis are involved. What a Class Two does becomes of interest to us only when it might have an adverse effect on the psionic program. Then it doesn't matter whether he's actually committing crimes or not. We close down on him very quickly. Indirectly, of course, that does protect the public.

"Ordinarily, it isn't a question of malice. A Class Two may get careless, or he begins to engage in horse play at the expense of his neighbors. He's amusing himself. But as a result, he draws attention. Bizarre things have happened which seemingly can't be explained by ordinary reasoning. At other times, such incidents would cause some speculation and then be generally forgotten. At present, they can have more serious repercussions. So we try to prevent them. If necessary, we provide cover explanations and do what is necessary to bring the offending psi under control."

"In what way do you control these people?" the visitor asked.

Boddo picked up the personal identification chart of Telzey Amberdon.

"Let's consider the case of the young psi who came through the space terminal a short while ago," he said. "It will illustrate our general methods satisfactorily." He blinked at the codings on the chart for a moment, turned it over, thrust one end into a small glowing desk receptacle marked FOR OCCASIONAL OBSERVATION, withdrew it and dropped it into a filing slot.

"We knew this psi would be arriving on Orado today," he went on. "We'd had no previous contact with her, and only one earlier report which indicated she had acted as a xenotelepath—that is, she had been in mental communication with members of a telepathic nonhuman race. That particular ability appears in a relatively small number of psis, but its possessor is more often than not a Class One who fails to develop any associated talents.

"The check made at the spaceport showed immediately that this youngster is not Class One. She is beginning to learn to read human minds, with limitations perhaps due chiefly to a lack of experience, and she has discovered the art of telephypnosis, which is a misnamed process quite unrelated to ordinary hypnotic methods, though it produces similar general effects. These developments have all taken place within the past few weeks."

The visitor gave him a startled look. "You make that child sound rather dangerous!"

Boddo shrugged. "As far as this office is concerned, she is at present simply a Class Two, with a quite good, though still largely latent, potential. She picked up a scrambled telepathic impulse directed deliberately at her, but was not aware then that her mind was being scanned by our machine. A really accomplished Class Two would sense that. Neither did she realize that the machine was planting a compulsion in her mind."

"A compulsion?" the official repeated.

Boddo considered, said, "In effect, she's now provided with an artificial conscience regarding her paranormal talents which suggests, among other things, that she should seek proper authorization in using them. That's the standard procedure we follow after identifying a Class Two."

"It prevents them from using their abilities?"

"Not necessarily. It does tend to keep them out of minor mischief, but if they're sufficiently self-willed and motivated, they're quite likely to override the compulsion. That's particularly true if they discover what's happened, as some of them do. Still, it places a degree of restraint on them, and eventually leads a good number to the Psychology Service . . . which, of course, is what we want."

The visitor reflected. "What would you have done if the girl had realized the Customs machine was investigating her mind?"

Boddo smiled briefly. "Depending on her reactions, the procedure might have become a little more involved at that point. The ultimate result would have been about the same—the compulsion would have been installed."

"Why not simply invite the Class Two psis you discover to join the Service?"

Boddo shook his head. "If they refused, the invitation would have told them more about the Service than they should know while they remain at large. We rarely invite them unless we're prepared to use forcible means of induction if necessary. A satisfactory percentage show up of their own accord."

"What do you do about the others?"

"After they're identified and classed, it depends largely on what they do. Ordinarily, an occasional check is made of their activities. If they don't make a problem of themselves or show some development which requires closer study, we leave them alone."

There was a pause. The official looked thoughtful. He said finally, "You feel then that the Service's method ot supervising psis is adequate?"

"It appears to keep the Class Two psis from causing trouble well enough," Boddo said. "Naturally, it isn't completely effective. For one thing, we can't expect to get a record of all of them. Then there's a divergent group called the unpredictables. Essentially they're just that. You might say the one thing they show in common is a highly erratic development of psionic ability.'

"What do you do about them?"

Boddo said, "We have no formula for handling unpredictables. It wouldn't be worth the trouble to try to devise one which was flexible enough to meet every possibility. They're very rarely encountered."

"So rarely that there's no reason to worry about them?"

Boddo scratched his cheek, observed, "The Service doesn't regard an unpredictable as a cause for serious concern."

II

Scowling with concentration, Telzey Amberdon sat, eyes closed, knees drawn up and arms locked about them, on the couch-bed in her side of duplex bungalow 18-19, Student Court Ninety-two, of Pehanron College. When she'd looked over last at the rose-glowing pointers of a wall clock on the opposite side of the room, they told her there wasn't much more than an hour left before Orado's sun would rise. That meant she had been awake all night, though she was only now beginning to feel waves of drowsiness.

Except for the glow from the clock, the room was dark, its windows shielded. She had thought of turning on lights, but there was a chance that a spot check by the college's automatic monitors would record the fact; and then Miss Eulate, the Senior Counselor of Section Ninety-two, was likely to show up during the morning to remind Telzey that a fifteen-year-old girl, even if she happened to be a privileged Star Honor Student, simply must get in her full and regular sleep periods.

It would be inconvenient just now if such an admonishment was accompanied by a suspension of honor-student privileges. So the lights stayed out. Light, after all, wasn't a requirement in sitting there and probing about in an unsuspecting fellow-creature's mind, which was what Telzey had been engaged in during the night.

If the mind being probed had known what was going on, it might have agreed with Miss Eulate. But it didn't. It was the mind of a very large dog named Chomir, owned by Gonwil Lodis who occupied the other side of the duplex and was Telzey's best college friend, though her senior by almost four years.

Both Gonwil and Chomir were asleep, but Chomir slept fitfully. He was not given to prolonged concentration on any one subject, and for hours Telzey had kept him wearily half dreaming, over and over, about certain disturbing events which he hadn't really grasped when they occurred. He passed most of the night in a state of vague irritation, though his inquisitor was careful not to let the feeling become acute enough to bring him awake.

It wasn't pleasant for Telzey either. Investigating that section of Chomir's mind resembled plodding about in a dark swamp agitated by violent convulsions and covered by a smothering fog. From time to time, it became downright nerve-racking as blasts of bewildered fury were transmitted to her with firsthand vividness out of the animal's memories. The frustrating side of it, however, was that the specific bits of information for which she searched remained obscured by the blurry, sporadic, nightmarish reliving which seemed to be the only form in which those memories could be made to show up just now. And it was extremely important to get the information because she suspected Chomir's experiences might mean that somebody was planning the deliberate murder of Gonwil Lodis.

She had got into the investigation almost by accident. Gonwil was one of the very few persons to whom Telzey had mentioned anything about her recently acquired ability to pry into other minds, and she had been on a walk with Chomir in the wooded hills above Pehanron College during the afternoon. Without apparent cause, Chomir suddenly had become angry, stared and sniffed about for a moment, then plunged bristling and snarling into the bushes. His mistress sprinted after him in high alarm, calling out a warning to anyone within earshot, because Chomir, though ordinarily a very well-mannered beast, was physically capable of taking a human being or somebody else's pet dog apart in extremely short order. But she caught up with him within a few hundred yards and discovered that his anger appeared to have spent itself as quickly as it had developed. Instead, he was acting now in an oddly confused and worried manner.

Gonwil thought he might have scented a wild animal. But his behavior remained a puzzle—Chomir had always treated any form of local wildlife they encountered as being beneath his notice. Half seriously, since she wasn't entirely convinced of Telzey's mind-reading ability, Gonwil suggested she might use it to find out what had disturbed him; and Telzey promised to try it after lights-out when Chomir had settled down to sleep. It would be her first attempt to study a canine mind.

Chomir turned out to be readily accessible to a probe, much more so than the half-dozen nontelepathic human minds Telzey had looked into so far, where many preliminary hours of search had been needed to pick up an individual's thought patterns and get latched solidly into them. With Chomir she was there in around thirty minutes. For a while, most of what she encountered appeared grotesquely distorted and incomprehensible; then something like a translating machine in Telzey's brain, which was the xenotelepathic ability, suddenly clicked in, and she found herself beginning to change the dog's sleep impressions into terms which had a definite meaning to her. It was a little like discovering the key to the operation of an unfamiliar machine. She spent an hour investigating and experimenting with a number of its mechanisms; then, deciding she could control Chomir satisfactorily for her purpose, she shifted his thoughts in the direction of what had happened that afternoon.

Around an hour or so later again, she stopped to give them both a rest.

The event in the hills didn't look any less mystifying now, but it had begun to acquire definitely sinister overtones. If Chomir had known of the concept of unreality, he might have applied it to what had occurred. He had realized suddenly and with a blaze of rage that somewhere nearby was a man whom he remembered from a previous meeting as representing a great danger to Gonwil. He had rushed into the woods with every intention of tearing off the man's head, but then the fellow suddenly was gone again.

That was what had left Chomir in a muddled and apprehensive frame of mind. The man had both been there, and somehow not been there. Chomir felt approximately as a human being might have felt after an encounter with a menacing phantom which faded into thin air almost as soon as it was noticed. Telzey then tried to bring the earlier meeting with the mysterious stranger into view; but here she ran into so much confusion and fury that she got no clear details. There were occasional impressions of white walls—perhaps a large, white-walled room—and of a narrow-faced man, who somehow managed to stay beyond the reach of Chomir's teeth.

By that time, Telzey felt somewhat disturbed. Something out of the ordinary clearly had happened. And supposing the narrow-faced stranger did spell danger to Gonwil.

Gonwil had told her, laughing, not believing a word of it, a story she'd been hearing herself since she was a child: how on Tayun, the planet from which she had come to Orado to be a student at Pehanron, there were people who had been responsible for the death of her parents when she was less than a year old, and who intended eventually to kill Gonwil as the final act of revenge for some wrong her father supposedly had done.

Tayun appeared to have a well-established vendetta tradition, so the story might not be completely impossible. But as Gonwil told it, it did seem very unlikely.

On the other hand, who else could have any possible reason for wanting to harm Gonwil?

The instant she asked herself the question, Telzey felt a flick of alarmed shock. Because now that the possibility had occurred to her, she could answer the question immediately. She knew a group of people who might very well want to harm Gonwil, not as an act of vendetta but for the simple and logical reason that it would be very much to their material benefit if Gonwil died within the next few months.

She sat still a while, barely retaining her contacts with Chomir while she turned the thought around, considered it and let it develop. If she was right, this was an extremely ugly thing, and she could see nothing to indicate she was wrong.

Late last summer she had been invited to spend a few days with Gonwil as house guests of a lady who was Gonwil's closest living relative and a very dear friend, and who would be on Orado with her family for a short stay before returning to Tayun. Socially speaking, the visit was not a complete success though Gonwil remained unaware of it. Telzey and the Parlin family—father, mother, and son—formed strong feelings of mutual dislike almost at sight, but stayed polite about it. Malrue Parlin was a handsome, energetic woman, who completely overshadowed her husband and son. She'd been almost excessively affectionate towards Gonwil.

It was Malrue, from what Telzey had heard, who had always been deeply concerned that the hypothetical vendettists might catch up with Gonwil some day . . .

When his parents left, Parlin Junior remained on Orado with the avowed intention of winning Gonwil over to the idea of becoming his bride. Gonwil, though moderately fond of Junior, didn't care for the idea. But, more from fear of hurting Malrue's feelings than his, she'd been unable to bring herself to brush Junior off with sufficient firmness. At least, he'd kept returning.

And the thing, Telzey thought, it never had accurred to Gonwil, or to her, to speculate about was that Gonwil had inherited a huge financial fortune which Malrue Parlin was effectively controlling at present, and which she would go on controlling if Junior's suit was successful . . . or again if Gonwil happened to die before she came of age, which she would in just three months time.

In spite of Gonwil's diffidence in handling Junior, it must have become clear to both Junior and his mother some while ago that the marriage plan had fizzled.

One somehow didn't consider that people one had met, even if one hadn't liked them, might be planning murder. It seemed too unnatural. But murder was in fact the most common of major crimes anywhere in the Hub, and it was general knowledge that the more sophisticated murderers quite regularly escaped retribution. The Federation's legal code made no more than a gesture of attempting to cope with them. It was a structure of compromises in everything but its essentials, with the primary purpose of keeping six hundred billion human beings living in more than a thousand semiautonomous sun systems away from wholesale conflicts while the area of generally accepted lawful procedure and precedent was slowly but steadily extended. In that, it was surprisingly effective. But meanwhile individual citizens could suddenly find themselves in situations where Federation Law told them in effect that it could do nothing and advised them to look out for themselves.

Murder, aside from its more primitive forms, frequently provided such a situation. There was a legal term for it, with a number of semilegal implications. It was "private war."

Telzey's impulse was to wake up Gonwil and tell her what had occurred to her. But she rejected the idea. She had only her report of Chomir's experiences to add to things Gonwil already knew; and so far those experiences proved nothing even if Gonwil didn't assume they existed in Telzey's imagination rather than in Chomir's memory. She would be incapable of accepting, even theoretically, that Malrue might want her dead; and in attempting to disprove it, she might very well do something that would precipitate the danger.

The thing to go for first was more convincing evidence of danger. Telzey returned her attention to Chomir.

Near morning, she acknowledged to herself she would get no further with the dog. He was responding more and more sluggishly and vaguely to her prods. She'd caught glimpses enough meanwhile to know his memory did hold evidence that wickedness of some kind was being brewed, but that was all. The animal mind couldn't co-operate any longer.

She should let Chomir rest for some hours at least. After he was fresh again, she might get at what she wanted without much trouble.

She eased off her contacts with his mind, drew away from it, felt it fade from her awareness. She opened her eyes again, yawned, sighed, reached over to the end of the couch and poked at the window-control shielding. The room's windows appeared in the far wall, the shrubbery of the tiny bungalow garden swaying softly in the predawn quiet of the student court. Telzey turned bleary eyes towards the wall clock.

In an hour and a half, her father would be at his office in Orado City. The city was just under an hour away by aircar, and she'd have to get his advice and assistance in this matter at once. If Gonwil's death was planned, the time set for it probably wasn't many days away. Malrue and her husband were supposed to be on their way back to Orado for another of their annual visits, and Chomir's hated acquaintance had turned up again yesterday. The danger period could be expected with Malrue's arrival.

By the time she'd showered, dressed and breakfasted, she found herself waking up again. Sunshine had begun to edge into the court. Telzey glanced at her watch, slipped on a wrist-talker, clipped her scintillating Star Honor Student pass to her hat, and poked at the duplex's interphone buzzer.

After some seconds, Gonwil's voice came drowsily from the instrument. "Uh . . . who . . ."

"Me."

"Oh . . . Whyya up so early?"

"It's broad daylight," Telzey said. "Listen, I'm flying in to Orado City to see my father. I'm starting right now. If anyone is interested, tell them I'll be back for lunch, or I'll call in."

"Right." Gonwil yawned audibly.

"I was wondering," Telzey went on. "When did you say Mr. and Mrs. Parlin are due to land?"

"Day after tomorrow . . . last I heard from Junior. Why?"

"Got anything planned for the first part of the holidays?"

"Well, just to stay away from Sonny somehow. He heard about the holidays."

"I've thought of something that will do exactly that," Telzey said.

"Fine!" Gonwil said heartily. "What?"

"Tell you when I get back. You're free to leave after lunch, aren't you?"

Gonwil clucked doubtfully. "There're six more test tapes I'll have to clean up, and Finance Eleven is a living stinker! I think I can do it. I'll get at it right away . . . Hey, wait a minute! Did you find out anything about . . . uh, well, yesterday?"

"We're started on it," Telzey said. "But I didn't really find out much."

In the carport back of the duplex, she eased herself into the driver's seat of a tiny Cloudsplitter and turned it into an enclosed ground traffic lane. The Star Honor Student pass got her through one of Pehanron's guard-screen exits without question; and a minute later the little car was air-borne, streaking off towards the east.

Twenty miles on, Telzey checked the time again, set the Cloudsplitter to home in on one of Orado City's major traffic arteries, and released its controls. Her father should be about ready to leave his hotel by now. She dialed his call number on the car's communicator and tapped in her personal symbol.

Gilas Amberdon responded promptly. He had been, he acknowledged, about ready to leave; and yes, he would be happy to see her at his office in around forty-five minutes. What was it about?

"Something to do with xenotelepathy," Telzey said cautiously.

"Let's hear it." His voice had changed tone only slightly.

"That would take a little time, Gilas."

"I can spare the time."

He listened without comment while she told him about her attempt to explore Chomir's memories, what she seemed to have found, and what she was concluding from it. It would be easy to persuade Gonwil to keep out of sight for a day or two, with the idea of avoiding Junior; after that, her loyalty to Malrue might create additional problems.

Gilas remained silent for a little after she finished. Then he said, "I'll do two things immediately, Telzey."

"Yes?"

"I'll have the Kyth Agency send over an operator to discuss the matter—Dasinger, if he's available. If your mysterious stranger is remaining in the vicinity of Pehanron College, the agency should be able to establish who he is and what he's up to. Finding him might not be the most important thing, of course."

Telzey felt a surge of relief. "You do think Malrue Parlin —"

"We should have some idea about that rather soon. The fact is simply that if the situation between Gonwil and the Parlins is as you've described it in respect to the disposal of her holdings in case of death, it demands a close investigation in itself. Mrs. Parlin, while she isn't in the big leagues yet, is considered one of the sharper financial operators on Tayun."

"Gonwil says she's really brilliant."

"She might be," Gilas said. "In any case, we'll have a check started to determine whether there have been previous suggestions of criminality connected with her operations. We'll act meanwhile on the assumption that the danger exists and is imminent. Your thought of getting Gonwil away from the college for a couple of days, or until we see the situation more clearly, is a very good one. We'll discuss it when you get here."

"All right."

"I don't quite see," Gilas went on, "how we're going to explain what we want done in the matter of the man the dog's run into twice without revealing something of your methods of investigation."

"No. I thought of that."

He hesitated. "Well, Dasinger's agency is commendably close-mouthed about its clients' affairs. The information shouldn't go any further. Are you coming in your own car?"

"Yes."

"Set it down on my private flange then. Ravia will take you through to the office."

III

Switching off the communicator, Telzey glanced at her watch. For the next thirty minutes, the Cloudsplitter would continue on automatic towards one of the ingoing Orado City air lanes. After it swung into the lane, she would make better time by taking over the controls. Meanwhile, she could catch up on some of the sleep she'd lost.

She settled back comfortably in the driver's seat and closed her eyes.

At once a figure which gave the impression of hugeness began to appear in her mind. Telzey flinched irritably. It had been over a week since the Psionic Cop last came climbing out of her unconscious to lecture her; she'd begun to hope she was finally rid of him. But he was back, a giant with a stern metallic face, looking halfway between one of the less friendly Orado City air patrolmen and the humanized type of robot. In a moment, he'd start warning her again that she was engaging in activities which could lead only to serious trouble.

She opened her eyes abruptly and the Cop was gone. But she might as well give up the idea of a nap just now.

The compulsion against using telepathy somebody had thoughtfully stuck her with was weakening progressively, but the long session with Chomir could have stirred it up enough to produce another series of nightmares in which the Psionic Cop chased her around to place her under arrest. Half an hour of nightmares wouldn't leave her refreshed for the meeting with Gilas' detectives.

Telzey straightened up, sat frowning at the horizon. There had been no way of foreseeing complications like the Psionic Cop when the telepathic natives of Jontarou nudged her dormant talent into action, a little over eight weeks ago. The prospects of life as a psi had looked rather intriguing. But hardly had she stepped out of the ship at Orado City when her problems began.

First, there'd been the touch of something very much like a strong other-mind impulse in the Customs Hall. Some seconds after it faded, Telzey realized it hadn't been structured enough to be some other telepath's purposeful thought. But she'd had no immediate suspicions. The Customs people used a psionically powered inspection machine, and she was within its field at the moment. Undoubtedly, she'd picked up a brief burst of meaningless psionic noise coming from the machine.

She forgot about that incident then, because her mother met her at the spaceport. Federation Councilwoman Jessamine Amberdon had been informed of the events on Jontarou, and appeared somewhat agitated about them. Telzey found herself whisked off promptly to be put through a series of psychological tests, to make sure she had come to no harm. Only when the tests indicated no alarming changes in her mental condition, in fact no detectable changes at all, did Jessamine seem reassured.

"Your father took immediate steps to have your part in the Jontarou matter hushed up," she informed Telzey. "And . . . well, xenotelepathy hardly seems very important! You're not too likely to run into telepathic aliens again." She smiled. "I admit I've been worried, but it seems no harm has been done. We can just forget the whole business now."

Telzey wasn't too surprised. Jessamine was a sweet and understanding woman, but she had the streak of conservatism which tended to characterize junior members of the Grand Council of the Federation. And discreet opinion-sampling on shipboard already had told Telzey that conservative levels of Hub society regarded skills like telepathy as being in questionable taste, if, indeed, they were not simply a popular fiction. Jessamine must feel it could do nothing to further the brilliant career she foresaw for her daughter if it was rumored that Telzey had become a freak.

It clearly was not the right time to admit that additional talents of the kind had begun to burgeon in her on the trip home. Jessamine was due to depart from Orado with the Federation's austere Hace Committee within a few days, and might be absent for several months. It wouldn't do to get her upset all over again.

With Telzey's father, it was a different matter. Gilas Amberdon, executive officer of Orado City's Bank of Rienne, could, when he chose, adopt a manner conservative enough to make the entire Hace Committee look frivolous. But this had never fooled his daughter much, and Gilas didn't disappoint her.

"You appear," he observed in the course of their first private talk after her return, "to have grasped the principle that it rarely pays to give the impression of being too unusual."

"It looks that way," Telzey admitted.

"And of course," Gilas continued, "if one does happen to be quite unusual, there might eventually be positive advantages to having played the thing down."

"Yes," Telzey agreed. "I've thought of that."

Gilas tilted his chair back and laced his fingers behind his neck. It was his customary lecture position, though there appeared to be no lecture impending at the moment.

"What are your plans?" he asked.

"I want to finish law school first," Telzey said. "I think I can be out of Pehanron in about two years—but not if I get too involved in something else."

He nodded. "Then?"

"Then I might study telepathy and psionics generally. It looks as if it could be very interesting."

"Not a bad program," Gilas observed absently. He brought his chair back down to the floor, reached for a cigarette and lit it, eyes reflective.

"Psionics," he stated, "is a subject of which I know almost nothing. In that I'm not unique. Whatever research worthy of the name is being done on it has been going on behind locked doors for some time. Significant data are not released."

Telzey frowned slightly. "How do you know?"

"As soon as I learned of your curious adventures on Jontarou, I began a private investigation. A fact-finding agency is at present assembling all available information on psionics, sorting and classifying it. Because of the general aroma of secrecy in that area, they haven't been told for whom they're working. The results they obtain are forwarded to me through the nondirect mailing system."

Oh, very good! He couldn't have arranged things better if she'd told him just what she wanted.

"How useful the material we get in that manner will be remains to be seen," Gilas concluded. "But we have two years to consider what other approaches are indicated."

Telzey took a selection of the tapes already forwarded to the bank by the fact-finding agency back to college with her. It had begun to be apparent on the return trip from Jontarou, when she was checking through the space liner's library, that there was something distinctly enigmatic about the subject of psis in the Hub. It expressed itself in the lack of information. She discovered a good deal on the government-controlled psionic machines, but what it all added up to was that they were billion-credit gadgets with mystery-shrouded circuits, which no private organization appeared able to build as yet, though a variety of them had been in public service for years.

About human psis, there was nothing worth the trouble of digging it out.

In her rooms at Pehanron that evening, she went over the fact-finding agency's tapes. Again there was nothing really new. The reflection that all this could hardly be accidental crossed her mind a number of times.

Later in the night, Telzey had her first dream of the Psionic Cop. He came tramping after her, booming something about having received complaints about her; and for some reason it scared her silly. She woke up with her heart pounding wildly and found herself demonstrating other symptoms of anxiety. After getting a glass of water, she lay down again to think about it.

It had been a rather ridiculous dream, but she still felt shaky. She almost never had nightmares. But in Psych Two she'd learned that a dream, in particular a nightmare, always symbolized something of significance to the dreamer, and there had been instructions in various self-help methods which could be used in tracking a disturbing dream down to its source.

It took around an hour to uncover the source which had produced the dream-symbol of the Psionic Cop.

There was no real question about its nature. She'd been given a set of suggestions, cunningly interwoven with various aspects of her mental life, and anchored to emotional disturbance points. When she acted against the suggestions, the disturbances were aroused. The result had been a menacing dream.

She dug at the planted thoughts for a while, then decided to leave them alone. If the Psych texts were right, nothing in her mind that she had taken a really thorough look at was going to bother her too much again.

The question was who had been interested in giving her such instructions. Who didn't want her to experiment with psionics on her own or get too curious about it?

From there on, the details began to fall into place . . .

The odd burst of psionic noise as she came through the Customs hall at the space terminal in Orado City—Telzey considered it, edgy with a sense of apprehensive discovery.

The Customs machine certainly wasn't supposed to be able to affect human minds. But it belonged to the same family as the psionic devices of the rehabilitation centers and mental therapy institutions, which did read, manipulate, and reshape human minds. The difference, supposedly, was simply that the Customs machine was designed to do other kinds of work.

But the authority which designed, constructed and maintained all psionic machines, the Federation's Psychology Service, was at present keeping the details of design and construction a carefully guarded secret. The reason given for this was that experimentation with the machines must be carried further before such details could be offered safely to the public. Which meant that whatever the Psychology Service happened to want built into any of its machines could be built into it. And that might include something which transmitted to the mind of psis an order to either enter the Psychology Service or stop putting their special abilities to use.

That was roughly what the suggestions they'd put into *her* mind amounted to.

But what was the purpose?

She couldn't know immediately—and, probably, she was not supposed to be wondering. The dream had led her to discover their trick, and that had brought her to the edge of something they wouldn't want known.

It wasn't a comfortable reflection. Telzey had listened to enough political shop talk among her mother's colleagues to know that the Federation could act in very decisive, ruthless ways in a matter of sufficient importance. And here was something, some plan or policy in connection with psis and psionics, apparently important enough to remain unknown even to junior members of the Federation's Grand Council! Jessamine would have expressed a very different kind of concern if she'd had any inkling that a branch of Federation government was interested in her daughter's experience with xenotelepathy.

Telzey rubbed her neck pensively. She could keep such thoughts to herself, but she couldn't very well help having them. And if the Psychology Service looked into her mind again, they might not like at all what she'd been thinking.

So what should she do?

The whole thing was connected, of course, with their top-secret psionic machines. There was one of those—a supposedly very advanced type of mind reader, as a matter of fact—about which she could get detailed firsthand information without going farther than the Bank of Rienne. And she might learn something from that which would fill in the picture for her.

The machine was used by Transcluster Finance, the giant central bank which regulated the activities of major financial houses on more than half the Federation's worlds, and wielded more actual power than any dozen planetary governments. In the field of financial ethics, Transcluster made and enforced its own laws. Huge sums of money were frequently at stake in disputes among its associates, and machines of presumably more than human incorruptibility and accuracy were therefore employed to help settle conflicting charges and claims.

Two members of the Bank of Rienne's legal staff who specialized in ethics hearings were pleased to learn of Telzey's scholarly interest in their subject. They explained the proceedings in which the psionic Verifier was involved at considerable length. In operation, the giant telepath could draw any information pertinent to a hearing from a human mind within minutes. A participant who wished to submit his statements to verification was left alone in a heavily shielded chamber. He sensed nothing, but his mind became for a time a part of the machine's circuits. He was then released from the chamber, and the Verifier reported what it had found to the adjudicators of the hearing. The report was accepted as absolute evidence; it could not be questioned.

Rienne's attorneys felt that the introduction of psionic verification had in fact brought about a noticeable improvement in ethical standards throughout Transcluster's vast finance web. Of course it was possible to circumvent the machines. No one was obliged to make use of them; and in most cases, they were instructed to investigate only specific details of thought and memory indicated to them to confirm a particular claim. This sometimes resulted in a hearing decision going to the side which most skillfully presented the evidence in its favor for verification, rather than to the one which happened to be in the right. A Verifier was, after all, a machine and ignored whatever was not covered by its instructions, even when the mind it was scanning contained additional information with a direct and obvious bearing on the case. This had been so invariably demonstrated in practice that no reasonable person could retain the slightest qualms on the point. To further reassure those who might otherwise hesitate to permit a mind-reading machine to come into contact with them, all records of a hearing were erased from the Verifier's memory as soon as the case was closed.

And that, Telzey thought, did in a way fill in the picture. There was no evidence that Transcluster's Verifiers operated in the way they were assumed to be operating—except that for fifteen years, through innumerable hearings, they had consistently presented the appearance of being able to operate in no other manner. But the descriptions she'd been given indicated they were vaster and presumably far more complex instruments than the Customs machine at the Orado City space terminal; and from that machine—supposedly no telepath at all—an imperceptible psionic finger had flicked out as she passed to plant a knot of compulsive suggestions in her mind.

So what were the Verifiers doing?

One of them was set up, not at all far away, in the Transcluster Finance Central in Draise. The Central was the heart of Hub finance, a key point of the Federation. Every moment of the day, enormously important information was coming in to it from a thousand worlds—flowing through the vicinity of the Psychology Service's mind-reading device.

Could it really be restricted to scanning specific minute sections of the minds brought into contact with it in the ethics hearings?

Telzey wondered what the two amiable attorneys would say if she told them what she thought about that.

But, of course, she didn't.

It was like having wandered off-stage, accidentally and without realizing it, and suddenly finding oneself looking at something that went on behind the scenery.

Whatever the purpose of the something was, chance observers weren't likely to be welcome.

She could tiptoe away, but so long as the Psychology Service was theoretically capable of looking inside her head at any moment to see what she had been up to, that didn't change anything. Sooner or later they'd take that look. And then they'd interfere with her again, probably in a more serious manner.

So far, there seemed to be no way of getting around the advantage they had in being able to probe minds. Of course, there were such things as mind blocks. But even if she'd known how to go about finding somebody who would be willing to equip her with one, mind blocks were supposed to become dangerous to one's mental health when they were retained indefinitely. And if she had one, she would have to retain it indefinitely. Mind blocks weren't the answer she wanted.

On occasion, in the days following her conversation with the ethics hearing specialists, Telzey had a very odd feeling that the answer she wanted wasn't far away. But nothing else would happen; and the feeling faded quickly. The Psionic Cop popped up in her dreams now and then, each time with less effect than before; or, more rarely, he'd come briefly into her awareness after she'd been concentrated on study for a few hours. On the whole, the Cop was a minor nuisance. It looked as if the underlying compulsion had been badly shaken up by the digging around she'd done when she discovered it, and was gradually coming apart.

But that again might simply prompt the Psychology Service to take much more effective measures the next time.

That was how matters stood around the beginning of the third week after Telzey's return from Jontarou. Then, one afternoon, she met an alien who was native to a nonoxygen world human listed by a cosmographic code symbol, and who possessed a well-developed psionic talent of his own.

She had spent several hours that day in one of Orado City's major universities to gather data for a new study assignment and, on her way out, came through a hall containing a dozen or so live habitat scenes from wildly contrasting worlds. The alien was in one of the enclosures, which was about a thousand cubic yards in size and showed an encrusted jumble of rocks lifting about the surface of an oily yellow liquid. The creature was sprawled across the rocks like a great irregular mass of translucent green jelly, with a number of variously shaped, slowly moving crimson blotches scattered through its interior.

Strange as it appeared, she was in a hurry and wouldn't have done more than glance at it through the sealing energy field which formed the transparent front wall if she hadn't caught a momentary telepathic impulse from within the enclosure as she passed. This wasn't so unusual in itself; there was, when one gave close attention to it, frequently a diffused psionic murmuring of human or animal origin or both around, but as a rule it was as unaware and vague as the sound somebody might make in breathing.

The pulse that came from the alien thing seemed quite different. It could have been almost a softly whispered question, the meaningful probe of an intelligent telepath.

Telzey checked, electrified, to peer in at it. It lay motionless, and the impulse wasn't repeated. She might have been mistaken.

She shaped a thought herself, a light, unalarming "Hello, who are you?" sort of thought, and directed it gently at the green-jelly mass on the rocks.

A slow shudder ran over the thing; and then suddenly something smashed *through* her with numbing force. She felt herself stagger backwards, had an instant's impression of another blow coming, and of raising her arm to ward it off. Then she was somehow seated on a bench at the far end of the hall, and a uniformed attendant was asking her concernedly how she felt. It appeared she had fainted for the first time in her life. He'd picked her up off the floor and carried her to the bench.

Telzey still felt dazed, but not nearly dazed enough to tell him the truth. At the moment, she wasn't sure just what had happened back there, but it definitely was something to keep to herself. She told him the first thing to come to her mind, which was that she had skipped lunch and suddenly began to feel dizzy. That was all she remembered.

He looked somewhat relieved. "There's a cafeteria upstairs."

Telzey smiled, nodded. "I'll eat something and then I'll be all right!" She stood up.

The attendant didn't let her get away so easily. He accompanied her to the cafeteria, guiding her along by an elbow as if she were an infirm old lady. After he'd settled her at a table, he asked what she would like, and brought it to her. Then he sat down across from her.

"You do seem all right again!" he remarked at last. His anxious look wasn't quite gone. "The reason this has sort of spooked me, miss," he went on, "is something that happened about half a year ago."

"Oh? What was that?" Telzey asked carefully, sipping at the foamy chocolate-colored drink he had got for her. She wasn't at all hungry, but he obviously intended to hang around until she downed it.

There had been this other visitor, the attendant said, a well-dressed gentleman standing almost exactly where Telzey had been standing. The attendant happened to be glancing towards him when the gentleman suddenly began to stagger around, making moaning and screeching sounds, and dropped to the floor. "Only that time," the attendant said, "he was dead before we got there. And, ugh, his face . . . well, excuse me! I don't want to spoil your appetite. But it was a bad affair all around."

Telzey kept her eyes on her drink. "Did they find out what was wrong with him?"

"Something to do with his heart, they told me." The attendant looked at her doubtfully. "Well, I suppose it *must* have been his heart. It's just that those are very peculiar creatures they keep in that hall. It can make you nervous working around them."

"What kind of creatures are they?" Telzey asked.

He shook his head, said they didn't have names. Federation expeditions brought them back from one place and another, and they were maintained here, each in its made-to-order environment, so the scientists from the university could study them. In his opinion, they were such unnatural beasts that the public should be barred from the hall; but he didn't make the rules. Of course, there was actually no way they could hurt anybody from inside the habitat tanks, not through those force fields. But it had unnerved him today to see another visitor topple over before that one particular tank.

He returned to his duties finally, and Telzey pushed her empty glass aside and considered the situation.

By now, every detail of what happened there had returned to her memory. The green-jelly creature definitely did hurt people through the energy screens around its enclosure . . . if the people happened to be telepaths. In them it found mental channels through which it could send savage surges of psi force. So the unfortunate earlier visitor had been a psi, who responded as unsuspectingly as she did to the alien's probing whisper, and then met quick death.

She'd fallen into the same trap, but escaped. In the first instant of stunned confusion, already losing consciousness, she'd had a picture of herself raising her arm to block the creature's blows. She hadn't done it, of course; the blows weren't physical ones, and couldn't be blocked in that manner. But in the same reflexive, immediate manner, she'd done something else, not even knowing what she did, but doing it simply because it was the only possible defensive move she could have made at that instant, and in that particular situation.

Now she knew what the move had been. Something that seemed as fragile as a soap bubble was stretched about her mind. But it wasn't fragile. It was a curtain of psi energy she'd brought into instant existence to check the creature's psi attack as her senses blacked out.

It was still there, unchanged, maintaining itself with no further effort on her part. She could tell that it would, in fact, take a deliberate effort to destructure it again—and she had no intention of doing that until she was a good, long distance away from the hostile mind in the habitat tank downstairs.

Although it needn't be, Telzey thought, a particularly hostile creature. Perhaps it had simply acted as it would have done on its own world where other telepathic creatures might be a natural prey, to be tricked into revealing themselves as they came near, and then struck down.

In a public park, ten minutes later, she sat down in a quiet place where she could make an undisturbed investigation of her psi bubble and its properties. After an hour or so, she decided she had learned enough about it for the moment, and went back to the hall of the live habitat scenes. There was a different attendant on duty now, and half a dozen other people were peering in at the occupant of one of the other tanks.

Telzey settled down on a bench opposite the enclosure of the green-jelly alien. He lay unmoving on his rocks and gave no indication of being aware of her return. She opened a section of the bubble, and sent him a sharp "You, there!" thought. A definitely unfriendly thought.

At once, he slammed back at her with a violence which seemed to shake the hall all around her. But the bubble was closed again, and there were no other effects. The attendant and the people farther down the hall obviously hadn't sensed anything. This was a matter strictly between psis.

Telzey let a minute or so pass before she gave the creature another prodding thought. This time, he was slower to react, and when he did, it was with rather less enthusiasm. He mightn't have liked the experience of having his thrusts bounced back by the bubble.

He had killed a human psi and tried to kill her, but she felt no real animosity towards him. He was simply too different for that. She could, however, develop a hate-thought if she worked at it, and she did. Then she opened the bubble and shot it at him.

The outworld thing shuddered. He struck back savagely and futilely. She lashed him with hate again, and he shuddered again.

Minutes later, he suddenly went squirming and flowing down the rocks and into the oily yellow liquid that washed around them. He was attempting panicky flight, and there was nowhere to go. Telzey stood up carefully and went over to the enclosure, where she could see him bunched up against the far side beneath the surface. He gave the impression of being very anxious to avoid further trouble with her. She opened the bubble wider than before, though still with some caution, picked out his telepathic channels and followed them into his mind. There was no resistance, but she flinched a little. The impression she had—translated very roughly into human terms—was of terrified, helpless sobbing. The creature was waiting to be killed.

She studied the strange mind a few minutes longer, then drew away from it, and left the habitat hall. It wouldn't be necessary to do anything else about the green-jelly alien. He wasn't very intelligent, but he had an excellent memory.

And never, never, *never*, would he attempt to attack one of the terrible human psis again.

Telzey had a curious feeling about the bubble. It was something with which she had seemed immediately more than half familiar. Letting it flick into being and out again soon was as automatic as opening and closing her eyes. And in tracing out the delicate manipulations by which its wispiest sections could be controlled and shifted, she had the impression of merely needing to refresh her memory about details already known. . . *This,* of course, was the way to go about *that!* That was how it worked . . .

There had been that other tantalizing feeling recently. Of being very close to an answer to her problems with the Psychology Service, but not quite able to see it. Perhaps the bubble had begun to form in response to her need for an answer and the awareness of it would have come to her gradually if the alien's attack hadn't brought it out to be put to instant emergency use. It was a fluid pattern, drawing the psi energy that sustained it from unknown sources, as if there were an invisible ocean of psi nearby to which she had put out a tap. She had heard of soft-bodied, vulnerable creatures which survived by fitting themselves into the discarded hard shells of other creatures and trudging about in them. The bubble was a little like that, though the other way around—something she had shaped to fit her; not a part of herself, but a marvelously delicate and adjustable apparatus which should have many uses beyond turning into a solid suit of psi armor in emergencies.

At the moment, for example, it might be used to prepare a deceptive image of herself to offer to future Psychology Service investigators.

That took several days. Then, so far as Telzey could tell, any significant thinking she did about psionics, or the Psychology Service and its machines, would produce only the blurriest of faint traces under a telepathic probe. The same for her memories on the subject, back to the night when she'd been scared out of sleep by her first dream of the Psionic Cop. And the explanation was that the Cop had scared her so that she'd lost her interest in the practice of telepathy then and there.

Since their suggestion had been to do just that, they might buy it. On the other hand, if they took a really careful look into her mind, the thought-camouflage might not fool them long, or even for an instant. But they'd have to start searching around then to find out what really had been going on; and if they touched any part of the bubble block, she should know it. She had made other preparations for that.

In a rented deposit vault of the nondirect mailing system in Orado City there was a stack of addressed and arrival-dated microtapes, all with an identical content; and on Telzey's wrist-talker were two new tiny control buttons keyed to the vault. Five minutes after she pressed down the first button, the tapes would be launched into the automatic mazes of the nondirect system, where nothing could intercept or identify them until they reached their individual destinations. She could stop the process by depressing the second button before the five minutes were up, but in no other manner. The tapes contained the thinking she'd done about the psionic machines. It might be only approximately correct, but it still was a kind of thinking the Psychology Service would not want to see broadcast at random to the news media of the Hub.

It wasn't a wholly satisfactory solution for a number of reasons, including the one that she couldn't know just what she might start by pushing the button. But it would have to do until she thought of something better. If there were indications of trouble, simply revealing that she could push it should make everybody quite careful for the moment. And after completing her preparations, she hadn't actually been expecting trouble, at least not for some while. She was behaving in a very innocuous manner, mainly busy with her legitimate studies; and that checked with the picture presented by the thought-camouflage. She'd talked about telepathy only to Gilas and Gonwil, telling Gonwil just enough to make sure she wouldn't mention the esoteric tapes Telzey occasionally immersed herself in to somebody else.

Now, of course, that might change to some extent. As Gilas had implied, they couldn't risk holding back information from the detectives he was employing, because what they withheld might turn out to have been exactly the information the detectives had needed. If they were as discreet as Gilas thought, it probably wouldn't matter much.

Telzey twisted her mouth doubtfully, staring at the thin, smoky lines of air traffic converging far ahead on Orado City . . .

Probably, it wouldn't!

IV

Several hours after Telzey's departure, Pehanron College's buildings and grounds, spreading up the sun-soaked hills above the residential town of Beale, were still unusually quiet.

Almost half the student body was struggling with midsummer examinations, and a good proportion of those who had finished had obtained permission to get off to an early start for the holidays. The carports extending along the backs of the student courts showed a correspondingly large number of vacancies, though enough gleaming vehicles remained to have supplied the exhibits for the average aircar show, a fair percentage running up into the price ranges of small interstellar freighters. Pehanron sometimes was accused of opening its lists only to the sons and daughters of millionaires; and while this wasn't strictly true, the college did scout assiduously for such of them as might be expected to maintain the pace of its rugged curriculum. Pehanron liked to consider itself a select hatchery from which sprang a continuous line of leaders in many fields of achievement, and as a matter of fact, it did turn out more than its share of imposing names.

There was no one in sight in Court Ninety-two when Senior Counselor Eulate turned into it, arriving from the direction of the managerial offices. Miss Eulate was a plump, brisk little woman whose normal expression when she felt unobserved was a vaguely worried frown. The frown was somewhat pronounced at the moment.

At the gate of the duplex bungalow marked 18-19, the counselor came to an abrupt stop. In the center of the short garden path, head and pointed wolf ears turned in her direction, lay a giant white dog of the type known as Askanam arena hounds—a breed regarded, so Miss Eulate had been told, as the ultimate in reckless canine ferocity and destructiveness when aroused.

The appearance of Chomir — a yellow-eyed, extravagantly muscled hundred-and-fifty-pounder — always brought this information only too vividly back to Miss Eulate's mind. Not wishing to arouse the silently staring monster now, she continued to hesitate at the gate. Then, hearing the intermittent purr of a tapewriter from beyond the open door at the end of the path, she called out in a carefully moderate tone. "Gonwil?"

The tapewriter stopped. Gonwil's voice replied, "Yes . . . is that you, Miss Eulate?"

"It is. Please keep an eye on Chomir while I come in."

"Oh, for goodness sake!" Gonwil appeared laughing in the door. She was eighteen; a good-looking, limber-bodied, sunny-tempered blonde. "Now you know Chomir won't hurt you! He *likes* you!"

Miss Eulate's reply was a skeptical silence. But she proceeded up the path now, giving the giant hound a wary four feet of clearance as she went by. To her relief, Chomir didn't move until she was past; then he merely placed his massive head back on his forelegs and half closed his eyes. Airily ignoring Gonwil's amused smile, Miss Eulate indicated the closed entrance door on the other side of the duplex as she came up. "Telzey isn't still asleep?"

"No, she left early. Did you want to see her?"

Miss Eulate shook her head.

"This concerns you," she said. "It would be better if we went inside."

In Gonwil's study, she brought a note pad and a small depth photo from her pocket. She held out the pad. "Do these names mean anything to you?"

Gonwil took the pad curiously. After a moment, she shook her head.

"No. Should they?"

Looking as stern as her chubby features permitted, Miss Eulate handed her the photo. "Then do you know these two people?"

Gonwil studied the two figures briefly, said, "To the best of my knowledge, I've never seen either of them, Miss Eulate. What is this about?"

"The Tayun consulate in Orado City had the picture transmitted to us a short while ago," Miss Eulate said. "The two persons in it—giving the names I showed you—called the consulate earlier in the morning and inquired about you."

"What did they want?"

"They said they had learned you were on Orado and would like to know where you could be found. They implied they were personal friends of yours from Tayun."

The girl shook her head. "They may be from Tayun, but we aren't even casually acquainted. I . . ."

"The consulate," Miss Eulate said grimly, "suspected as much! They secretly recorded the screen images of the callers, who were then requested to come to the consulate to be satisfactorily identified while your wishes in the matter were determined. The callers agreed but have failed to show up. The consulate feels this may indicate criminal intentions. I understand you have been placed on record there as being involved in a private war on Tayun, and . . ."

"Oh, no!" Gonwil wrinkled her nose in sudden dismay. "Not that nonsense again! Not just *now!*"

"Please don't feel alarmed!" Miss Eulate told her, not without a trace of guilty relish. The counselor took a strong vicarious interest in the personal affairs of her young charges, and to find one of them touched by the dangerous glamour of a private war was undeniably exciting. "Nobody can harm you here," she went on. "Pehanron maintains a very dependable security system to safeguard its students."

"I'm sure it does," Gonwil said. "But frankly, Miss Eulate, I don't need to be safeguarded and I'm not at all alarmed."

"You aren't?" Miss Eulate asked, surprised.

"No. Whatever reason these people had for pretending to be friends of mine . . . I can think of several perfectly harmless ones . . . they aren't vendettists."

"Vendettists?"

Gonwil smiled. "Commerical vendetta. An old custom on Tayun—a special kind of private war. A couple of generations ago it was considered good form to kill off your business competitors if you could. It isn't being done so much any more, but the practice hasn't entirely died out."

Miss Eulate's eyebrows rose. "But then . . ."

"Well, the point is," Gonwil said, "that *I'm* not involved in any vendetta or private war! And I never have been, except in Cousin Malrue's imagination."

"I don't understand," the counselor said. "Cousin Malrue . . . you're referring to Mrs. Parlin?"

"Yes. She isn't exactly a cousin but she's the closest relative I have. In fact, the only one. And I'm very fond of her. I practically grew up in the Parlin family . . . and, of course, they've more or less expected that Junior and I would eventually get married."

Miss Eulate nodded. "Rodel Parlin the Twelfth. Yes, I know." She had met the young man several times on his visits to the college to see Gonwil and gained an excellent impression of him. It looked like an eminently suitable match, one of which Pehanron would certainly have approved; but regrettably Gonwil had not returned Rodel Parlin the Twelfth's very evident affection in kind.

"Now, Cousin Malrue," Gonwil went on, "has always been afraid that one or the other of my father's old business enemies on Tayun was going to try to have me killed before I came of age. My parents and my uncle—my father's brother—founded Lodis Associates and made a pretty big splash in Tayun's financial world right from the start. Malrue and her husband joined the concern before I was born, and then, when I was about a year and a half old, my parents and my uncle were killed in two separate accidents. Cousin Malrue was convinced it was vendetta action . . . "

"Mightn't it have been?" Miss Eulate asked.

Gonwil shrugged. "She had some reason for suspecting it at the time. My parents and uncle apparently had been rather ruthless in the methods they used to build up Lodis Associates, and no doubt they had plenty of enemies. The authorities who investigated the matter said very definitely that the deaths had been accidental, but Malrue didn't accept that.

"Then, after the directors of a Tayun bank had been appointed my guardians, some crank sent them a message. It said my parents had died as a result of the evil they'd done, and that their daughter would never live to handle the money they had robbed from better people than themselves. You imagine what effect that had on Cousin Malrue!"

"Yes, I believe I can."

"And that," Gonwil said, "is really the whole story. Since then, every time it's looked as if I might have come close to being in an accident or getting harmed in some way, Cousin Malrue has taken it for granted that vendettists were behind it. The thing has simply preyed on her mind!"

Miss Eulate looked doubtful, asked, "Isn't it possible that you are taking the matter too lightly, Gonwil? As you may remember, I met Mrs. Parlin on one occasion here. We had quite an extensive conversation, and she impressed me as being a very intelligent and level-headed person."

"Oh, she is," Gonwil said. "Don't misunderstand me. Cousin Malrue is in fact the most intelligent woman I've ever known. She's been running Lodis Associates almost singlehandedly for the past fifteen years, and the firm's done very well in that time.

"No, it's just that one subject on which she isn't reasonable. Nobody can argue her out of the idea that vendettists are lurking for me. It's very unfortunate that those mysterious strangers, whoever they were, should have showed up just now. By Tayun's laws I'll become a responsible adult on the day I'm nineteen, and that's only three months away."

Miss Eulate considered, nodded. "I see! You will then be able to handle the money left you by your parents. So if the vendettists want to make good on their threat, they would have to, uh, eliminate you before that day!"

"Uh-huh," Gonwil said. "Actually, of course, most of the money stays in Lodis Associates, but from then on

I'll have a direct voice in the concern's affairs. The Parlin family and I own about seventy per cent of the stock between us. I suppose those nonexistent vendettists would consider that the same thing as handling my parents' money."

Miss Eulate was silent a moment. "If the people who called the consulate were not the vendettists," she said, "why should they have behaved in such a suspicious manner?"

Gonwil laughed ruefully.

"Miss Eulate, I do believe you could become almost as bad as Cousin Malrue about this! Why, they might have had any number of reasons for acting as they did. If they were from Tayun, they could know I'd soon be of age and they might have some business they'd like me to put money in. Or, perhaps they just didn't express themselves clearly enough, and they're actually friends of some friends of mine who asked them to look me up on Orado. Or, they could be from a Tayun news agency, looking for a story on the last member of the Lodis family. You see?"

"Well, there are such possibilities, of course," the counselor conceded. "However, I fail to understand then why you appear to be concerned about Mrs. Parlin's reactions. If nothing comes of the matter, isn't it quite unlikely that she'll ever learn that somebody has inquired about you?"

"Ordinarily, it would be," Gonwil said glumly. "But she and Rodel the Twelfth are due to arrive on Orado at almost any moment. I'd been expecting them the day after tomorrow, but Junior called an hour ago to say the schedule had changed, and they'd be here today. Malrue is bound to find out what happened, and, to put it mildly, she's going to be extremely upset!"

"Yes, no doubt." Miss Eulate hesitated, went on. "I dislike to tell you this, but it's been decided that until a satisfactory explanation for the appearance of the two strangers at the consulate has been obtained, certain steps will have to be taken to insure your personal safety. You understand that the college has a contractual obligation to your guardians to see that no harm comes to you while you are a student."

Gonwil looked at her, asked, "Meaning I'm restricted to the campus?"

"I'm afraid we'll have to go a little farther than that. We are assigning guards to see to it that no unauthorized persons enter bungalow 18-19, and I must instruct you not to leave it for the next day or two."

"Oh, dear! And all because . . ." Gonwil shook her blond head. "Cousin Malrue will have kittens when she hears *that!*"

The counselor looked surprised.

"But why should Mrs. Parlin have, uh, kittens?" she inquired. "Surely she will see that the college is acting only to keep you out of possible danger!"

"She simply won't believe I'm not in danger here, Miss Eulate! When my guardians enrolled me at Pehanron, she didn't at all like the idea of my coming to Orado by myself. That's why the college has had to put up with that monster Chomir for the past two years! My guardians thought it would calm Malrue down if I kept one of the famous Askanam arena hounds around as a bodyguard. They sent all the way there to get one of the best."

Miss Eulate nodded. "I see. I . . ." Her voice died in her throat.

Moving with ghostly quiet, Chomir had appeared suddenly in the doorway to the garden. He stood there, yellow eyes fixed on them. "He heard me use his name and came to see if I'd called him," Gonwil said apologetically. "I'll send him back out till we're finished."

"No," the counselor said with some firmness, "tell him to come in. I shouldn't allow him to frighten me, and I know it. Now is as good a time as any to overcome that weakness!"

Gonwil looked pleased. "Come on in, boy!"

The Askanam came forward, moving lightly and easily in spite of his size. In the patch of sunlight from the door, an ivory brindle pattern was faintly visible in the short white hair of his hide, the massive cables of surface muscle shifting and sliding beneath it. Miss Eulate, for all her brave words just now, felt her mouth go parched. Ordinarily she liked dogs, and Chomir was a magnificent dog. But there were those stories about his breed—merciless killers developed by painstaking geneticists to perform in the bloody arenas of Askanam and to provide the ruling nobility of that colorful and tempestuous world with the most incorruptible and savage of guards. . . .

"I imagine," the counselor observed uncomfortably, "that Chomir would, in fact, be an excellent protector for you if it became necessary."

"No doubt about that," Gonwil agreed. "And I very much hope it never becomes necessary. It would be a fearful mess! Have I told you what happened when they were going to teach him how to defend me?"

"No, you haven't," Miss Eulate acknowledged, wishing she hadn't brought up the subject.

"It was just before I left for Orado. My guardians had hired an Askanam dog trainer. Chomir wasn't much more than a pup then, but when they're training arena dogs on Askanam, they don't use human beings to simulate an attacker. They use special robots which look and move and smell like human beings.

"I found out why! They turned two of those poor machines loose on me, and Chomir shook both of them to pieces before I could shout, 'Stop!' The trainer told me that when he's really clamping his jaws down on something, he slams on close to two thousand pounds of pressure."

"Good heavens!" Miss Eulate said faintly.

"Anyway," Gonwil went on, unaware of the effect she was creating, "everyone decided right then that one thing

Chomir didn't need was attack training!" She prodded the dog's hard flank affectionately with a shoe tip. "Of course, he does have a terrific pedigree to account for it. His sire was a famous arena dog who killed thirty-two men and all kinds of fighting animals. He must have been a pretty horrible beast! And on his dam's side . . ."

She broke off, having finally caught Miss Eulate's expression, went on after a moment, "I don't really mind so much being confined to quarters. But I'm hoping the mystery at the consulate will be solved before the Parlins arrive. There's no possible way I could avoid seeing Malrue, and . . ."

She checked herself for the second time, added in a different tone, "That's Junior calling again now!"

"Eh?" Miss Eulate asked. Then, following Gonwil's gaze, she became aware of a faint, silvery tinkling from the table. A tiny, jewel-bright device stood there, out of which the sound evidently came. On closer inspection, it appeared to be a beautifully inlaid powder compact. Miss Eulate looked puzzledly back at the girl.

"A personalized communicator," Gonwil explained wryly. "A gift from Junior which came in the mail this morning. He has the twin to it, and the only use for the set is that Junior and I can talk together wherever either of us happens to be on Orado." She gave Miss Eulate a small smile, added, "Junior is very difficult to discourage!"

The miniature communicator stopped its tinkling for a few seconds, then began again. Gonwil still made no move towards it. Miss Eulate asked, "Aren't you going to answer him?"

"No. If I don't switch it on, he'll think I'm not around."

Miss Eulate sighed and arose.

"Well," she said, "I should get back to the office. We'll trust this has been, as you feel, a false alarm. But until we're quite certain of it, we must take whatever precautions seem indicated."

Gonwil grimaced resignedly.

The counselor went on, "And since the Bank of Rienne is acting for your guardians on Orado, I'm also obliged to see to it that they are informed of the occurrence."

At that, Gonwil's face suddenly brightened.

"Miss Eulate," she said, "when you make that call . . . and please make it at once . . . would you have it put through directly to Mr. Amberdon?"

"Why, yes, I can do that. But why specifically Mr. Amberdon?"

"He may be able to do something. Besides, Telzey's gone to see him. She should be with him just about this time—and she can usually think of a way out of anything."

"I'm quite aware of it," Miss Eulate said, rather shortly. Privately she regarded Telzey, in spite of her unquestioned scholastic brilliance, as something of a college problem. She added, "Well, I'll see what can be done."

To be concluded

in times to come

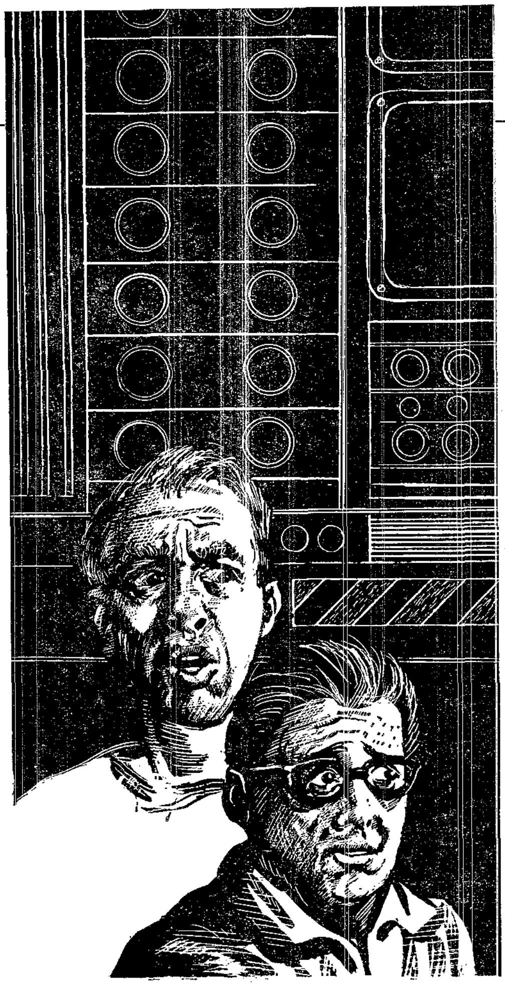
Next month's cover story is "Stuck," by John Berryman. You may remember "The Trouble with Telstar"? The problem of fixing a no-go communication relay satellite in orbit?

In this one, Berryman is considering certain other problems of satellites—like whose is which, and what do you do about one with no determinable or claimed owner, but unfriendly looking behavior in orbit? Again, a trip out into orbit for inspection seems called for—but this, it turns out, can have unexpected difficulties not in the rule books, or the military booby-trap manuals!

If we knew a little bit more about space, and the behavior of matter in space, it would be a great deal safer to operate out there.

But, of course—that's the basic trouble with all kinds of research; if you knew more, you'd know exactly how to go about it.

Then it wouldn't be research, of course! ■ *The Editor*



FAIR WARNING

JOHN BRUNNER

Naturally, no people wants anybody sticking his nose in to interfere with complete freedom of action; everyone wants to be free to do as he believes best . . .

Illustrated by Michael Arndt

I had this from someone I met in a London pub, so it's only fair to stress that (a) it's at best secondhand and (b) as the phrase goes, "names have been changed to protect the innocent."

There was this young man sitting at the bar. I came up and ordered a drink. He saw the pin on my lapel, which I always wear—the sign of the Society for the Prevention of Nuclear War. Pointing at it, he said, "You're scared!"

I said yes, because it was true. After all, the pin was there to provoke discussion with people. But I hoped he wasn't going to pick an argument at the moment, because he was clearly rather drunk.

He said, "I'm in the Navy. I'm scared. Sit down and listen."

The island lay baking in the sun like a large round cake. It was iced around the edge and all across its center with bright white sand, decorated with a crisscross design of felled trees, and on the sand a greeting for some giant-child's birthday had been written in the haphazard hieroglyphs of vehicle tracks. Exactly at its mid point was a black cabin made of corrugated iron; around this, in a tidy radial arrangement, latticework steel towers took the place of candles. The whole was set on the blue-silver platter of the Pacific Ocean and measured rather less than two miles each way.

It was an elaborate confection.

Beyond it, pegged out on the almost moveless water, there were large ships, none of them closer than fifteen miles away. Beached in the soft sand, or anchored to the atoll which ran out from the eastern side of the island a few feet below the surface, there were a few little ships. These were there to remove the men now working on the island to what was politely called a safe distance when zero hour approached. Yesterday the island had boasted over a hundred inhabitants, but most had already gone.

Now there remained a mere couple of dozen people on shore, mainly servicemen along to do the donkeywork of fetching and carrying. Already the landing craft were being loaded with unexpendable equipment: half-tracked trucks, spare scaffolding, the tents and field kitchens which had done their best to make the island seem military and efficient during the past few weeks. But it took the black cabin to make it look like anything other than a tropical paradise.

Shortly, of course, it would be a rather more than tropical hell.

A number of boats, fully loaded, moved away from the shore. Eventually one solitary boat headed in the opposite direction. It was one of the smallest vessels in sight, but even so it was ridiculously large by comparison with the single packing case which was its cargo.

Naturally, this was no ordinary packing case. Aside from rating an entire boat to itself, it was also entitled to a guard of four men and an escort in white coveralls who sat beside it wearing an anxious expression and listening through headphones to the *tock-tock-brrr* of a Geiger counter. The case itself was slung in a cradle of tension springs like those used to ship unique archaeological relics, and when the boat nosed softly against the shore the men who had to lift it treated it with far more care than an equivalent quantity of eggs.

Among the men who came to greet it on arrival, showing the courtesy normally only expended on visiting royalty, were the two most important men on the island. They had been the most important even when all the hundred-plus previous inhabitants had been here, although there were several of the hundred-plus to whom it was not politic to mention the fact.

One of them was balding and elderly, with a slight stoop and horn-rimmed glasses. He had disks of green glass clipped over the lenses against the sunlight. The other was older, but looked younger because he was tall and thin and stood very erect. As they waited for the crate's handlers to transfer it from the cradle in the boat to another similar cradle specially rigged on the flat back of a half-tracked pickup, the one with glasses pulled a handkerchief from his pocket and furiously wiped first the glasses and then his face.

"The heat!" he said.

His companion glanced at him and smiled without humor. "Don't let it get you down, Vliesser. It's going to be a lot hotter in a few hours' time."

Vliesser snorted. "We shall be well out of it by then. I swear, even if it means putting off the firing for half an hour I intend to get a shower before zero hour."

"Stand out on deck. The blast will pick up plenty of water."

"Rogan, do you have to be so cynical?"

"If I wasn't cynical," the tall man said "I'd be shaking like a leaf. Was it this way at Bikini in '54?"

"I don't know. I wasn't there. In any case, this is a new advance. Qualitatively new. What's the good of drawing empty comparisons?" Vliesser mopped his forehead.

"They used to tell a story to newcomers in the western states, about the bird that flew backwards because he liked to see where he'd been." Rogan chuckled. "That's me. I'm temperamentally unsuited for major forward steps."

The naval lieutenant who had been supervising the stowage of the packing case turned away from the pickup and saluted.

"The crate's ready to go to the cabin now, Dr. Rogan," he said. "You've been briefed on arrangements for the evacuation?"

Civilians in a target area, thought Rogan wryly. Aloud he answered, "Yes, we've been told. Directly we've armed the bomb we drive back to the beach; you'll be waiting at the boat, and we're to abandon the truck and come aboard."

"That's right," nodded the young officer. "Well, I'll get my men aboard now—I've been warned not to let them stay on shore while you're in the cabin." He hesitated. "Is that all?"

Rogan confirmed, and he saluted and went to round up his men.

Vliesser checked the spring cradle carrying the crate, gave a satisfied nod and addressed Rogan. "You know how to drive this . . . mechanical yak, I suppose? I didn't think to ask."

"Yes, I took a lesson on it a couple of days ago. Jump in." Rogan climbed over the low door into the driving seat; more awkwardly, Vliesser settled his podgy bulk in the passenger's place.

"Not less than a hundred and twenty people have seen the thing being built," he grunted. "You'd think one of them could be allowed to stay and give us a hand."

"Security," Rogan said. "I'm sure they'd be happier if even we didn't know how the thing is supposed to work. Matter of fact," he added reflectively, "I sometimes feel the same. But never mind. Hold on—here we go."

He started the engine, engaged a low gear, and began to ease the half-track up the gentle slope towards the black cabin.

Vliesser remained silent, mopping his forehead, for a full minute before speaking again. Then, not looking at his companion, he said, "Do you think it'll function?"

"Ask me this evening."

"Rogan, be serious. The occasion demands it. Think! The first man-made phoenix reaction—the first artificial carbon-nitrogen cycle—is probably going to be induced here, today!"

Guiding the vehicle carefully around some felled palms, Rogan nodded. "I hope it does work. I want to get back to something a bit more rewarding."

Vliesser glanced at him. "So you hope it will work? Do you not mean you hope it won't?"

"Not at all. I'm tired of being chased by the military towards bigger and better explosions. Now we've reached the level at which they're bound to lose interest. I mean, this really would be the weapon too terrible to use, wouldn't it?" He waved at the cabin ahead. "Let this thing off over open water, and you'll have a self-sustaining hydrogen reaction. It'd wipe the planet clean in about a twenty-fifth of a second."

"I made it decimal oh-five second," Vliesser said after a pause. "It's a function of the available deuterium."

"Don't let's argue," Rogan said with a wry smile, braking the half-track and swinging its nose around. After a couple of failures he backed it into a convenient position to unload.

Grumbling continually under his breath, Vliesser got down and helped his companion to man-handle the crate out of its springs. Carrying it between them, they entered the cabin. The black-painted walls had absorbed the sun, and the heat struck at them like a hammer.

"If this were TNT," Rogan said emotionlessly as he lowered his end of the crate, "I'd be running in case the heat in here set it off. Open it up, will you?"

Vliesser bent to the combination lock on the crate. He undid it, lifted off the lid. Inside there was insulation—a double layer of lead foil; flat cans of heavy water forming a false case inside the main one; more lead, in slabs rather than foil; rubber blocks to act as shock absorbers, and finally the trigger, a slender metal cylinder the length of a man's arm.

Rogan set it gently on the sliding cradle which was to take it into the very heart of the bomb mechanism. He gave it a pat, then took a note pad from the pocket of his shirt and began to read out a list of figures. As he read, Vliesser moved about him, checking dials and operating levers marked with the wasp sign—black and yellow stripes signifying DANGER.

Everything was normal. Rogan sighed with relief and pocketed the note pad again. He picked up two leads with crocodile clips on the ends and brought them to twin terminals peeking out of the end of the trigger. Vliesser's breathing was the loudest sound in the world.

The wires were slipped in place. Rogan muttered something to himself and pushed the lever beside the sliding cradle. Silently, the trigger ran down its oiled causeway into the appointed place.

"Now all we have to do is turn on the radio controls," said Vliesser. "Then we can go."

"Light the blue touchpaper and retire to a safe distance," Rogan quoted.

"What?" Vliesser glanced up sharply.

"Nothing. I was just thinking"—Rogan's eyes roved the mechanism surrounding them—"that you were right to say this was a great occasion. Shall we mark it appropriately?" He felt in the hip pocket of his khaki shorts and took out a flash. "Let's toast it, in the hope that it won't do the same to us."

"I can't say I share your sense of humor," Vliesser commented. "But I will cheerfully share your liquor."

Carefully, as he had armed the bomb, Rogan measured out half the contents of the flask into the lid for Vliesser, then raised the flask mockingly to his lips.

And his arm stopped. Everything stopped. He could not move a single muscle except his eyes and those involved in breathing. He tried to cry out, but failed, and from the look of terror which showed on Vliesser's face he knew that the same paralysis had overtaken them both.

A second or two later, out of the side of his eyes, he saw a shimmer in the air between him and the wall. It resembled a heat-effect, but was too sharply defined.

As stiff as though turned to stone, they stayed where they were.

Out of the shimmer in the air, a form was materializing. A form as tall as a man, but not quite shaped like a man, although it had the same number of limbs, the same proportion of head to trunk, and moved with a manlike gait.

Straining to see what it was, Rogan felt his eye muscles stabbed by pain, and he had to look to the front again, where all he could see was Vliesser, a statue depicting raw fear.

About ten minutes went by. During it they barely glimpsed the stranger, but they could guess what he was doing—he was going around the cabin checking all the mechanism which was so shortly due for a fast and fiery end. They heard clinking noises, and shuffling footsteps; once or twice they had a view of the stranger's back as he passed across their field of vision. But at no time did they see him clearly.

They heard him very well, of course. And that was the trouble.

When the tour of inspection was complete, the stranger paused in front of the shimmer in the air and—so it seemed to Rogan—glanced back. A voice tinged with sarcasm said, in perfect English with a strong American accent:

"Congratulations, gentlemen! Now you'll manage it!"

Their invisible bonds broke. Flask and lid crashed to the floor as they whirled.

But there was no one there.

The island baked on. Aboard a ship far out to sea, men looked impatiently at their watches. The young lieutenant in charge of the boat which was supposed to be taking Rogan and Vliesser away discovered that they were five full minutes overdue. He contemplated the relative risk of taking a party up to investigate and being court-martialed for disobeying orders, or doing nothing and being court-martialed for not going to the rescue. He decided to give the scientists another five minutes.

He hoped there hadn't been a mix-up in his orders. The island was only baking now; shortly it would be burned to a crisp. Possibly to even less.

Eventually his dilemma was solved. Aboard ship, someone who saw a fast promotion fading ordered a radio message to be sent, and the lieutenant took two of his men up to the black cabin, in a rather agitated hurry.

They found the cabin stinking of whisky, and Vliesser and Rogan busy smashing the equipment to pieces.

"You were the lieutenant who found them?" I said. I knew the recent Pacific tests had been joint Anglo-American undertakings, of course.

He looked at his empty glass. "I didn't say that," he muttered. "Matter of fact, I didn't say anything. I didn't say anything at all."

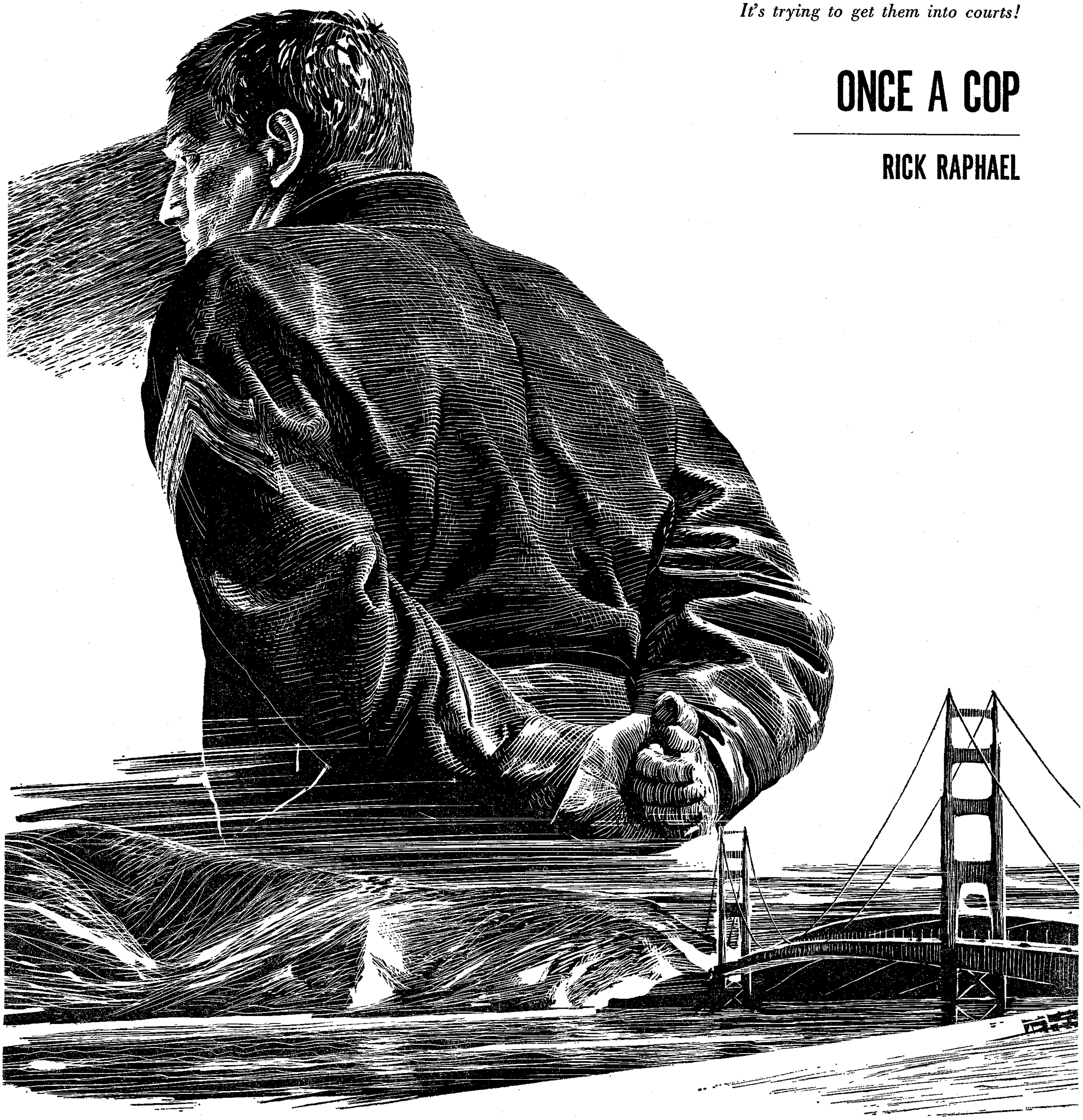
He got off his stool and walked, as though he had taken patient aim, straight through the door. He didn't even sway. When I got to the door myself, he was nowhere to be seen.

As I mentioned at the beginning, the names have been changed to protect innocent people. Like us. ■

The toughest challenges an honest cop faces
aren't on the high-speed highways,
nor from gun-toting criminals, nor in the courts.
It's trying to get them into courts!

ONCE A COP

RICK RAPHAEL



Patrol Trooper Clay Ferguson hummed happily to himself and eyed the chronometer in the center of the instrument panel. The night sky thirty miles ahead glowed with the lights of San Francisco and it was just a little past midnight. If they could only have a few more hours of relatively quiet traffic, they'd hit Los Angeles Barracks about daylight and a five-day rest before the start of the next leg of the patrol. To either side of the bubble canopy that covered the cab of North American Thruway Patrol Car 56, two rivers of moving lights flowed with the police vehicle in the four variable speed lanes of the superhighway. But traffic densities were relatively light on all four of the southbound lanes. This was NAT 99-S—North American Thruway 99-South—stretching from Fairbanks, Alaska to San Diego. A half mile east of the high-speed southbound yellow lane was NAT 99-N, four identical half-mile-wide lanes of northbound traffic plus the northbound police lane.

In the left-hand bucket seat of Car 56—"Beulah" to her three-member crew—Patrol Sergeant Ben Martin relaxed with a cigarette. The lights of the much heavier northbound traffic silhouetted Martin's crop-haired head.

The sixty-foot-long police cruiser glided smoothly down the center red emergency lane of the thruway at a steady hundred miles an hour, just keeping pace with the slowest vehicles in the slow white lane a mile to the right.

"What's 'fleshpot' mean, Ben?" the Canadian asked.

The senior officer turned his broad-planed face and grinned. "You planning on finding one when we hit L.A.?"

Clay shrugged. "I've heard the expression and it sounds interesting. Only trouble is that I've never been able to find out exactly what it means. But after ten days in this oversized sardine can, almost anything would sound interesting."

Below the chronometer, the big radiometer clicked off another mile marker as Car 56 rolled past the beamed signal from the automatic radio marker posts that lined the thruways from one terminal point to another. Beulah's crew was now two thousand nine hundred four miles and nine and a half days out of Fairbanks with a half a day and a little more than four hundred miles to go to the end of this patrol.

Clay reached up to fiddle with the focus knob on one of the four video screens on his control panel. The screens transmitted views of each lane from tower cameras mounted above the lanes at every ten-mile interval.

"Anyone who takes a girl for an aircar ride in the middle of an Alaskan summer and then parks on the edge of a lake in the center of a swarm of mosquitoes," Ben said, "has a built-in fleshpot."

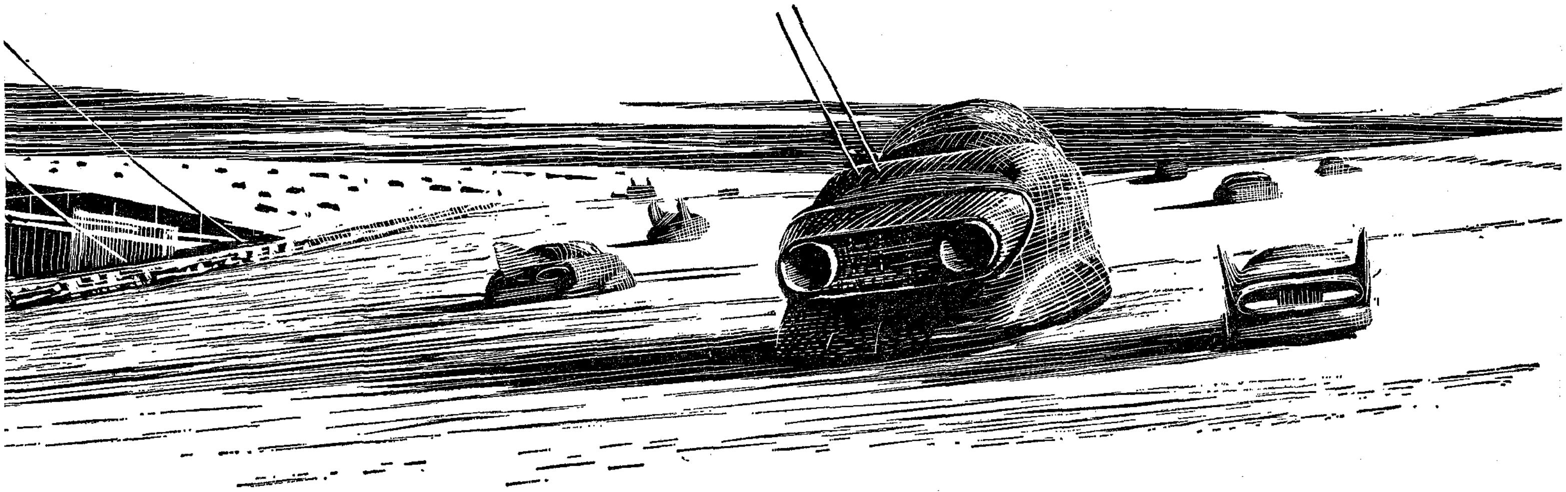
Clay grinned sheepishly, "Cut it out, pop. I still itch every time I think about it."

Car 56 started a gentle climb into the hills to the north of the Golden Gate and the tracks rumbled slightly as the roadway passed over a high culvert. Ahead, wisps of fog drifted into the great white beam from the three-foot wide variable intensity headlight strip across the cruiser's bow. Ben reached forward and shifted the light color spectrum into the yellow range.

A bank of speakers above their heads came to life. "Frisco Control to Car Nine One One." Car 911 came back with a "go ahead." Frisco Control continued. "You've got a bad one at Marker 3112. Cargo carrier took out a passenger vehicle in the blue. Take it Code Three. And watch the fog."

"Car 911 on the way," came the reply. Fifty miles ahead of Martin and Ferguson another Nor-Com police cruiser slammed forward, lifting from the roadway and its tracks

Illustrated by John Schoenhenr



as its fan drive impellers roared into action. Riding on an air pad, the cruiser's twin jets kicked to near full power under the drive of the pair of one hundred and fifty thousand pound thrust engines.

The radio continued: "Frisco Control to all cars on 99 north and south from Markers 2900 to 3100. Heavy fog conditions now exist. Yellow lanes closing in two minutes. Speed reductions in force throughout designated area. Observe caution."

The last transmission was broadcast on standard, all-vehicle frequency and was received by all cars and cargo carriers as well as Nor-Com police cruisers and work vehicles.

The fog was getting thicker and Ben again shifted the spectrum of the headlight deeper into the yellow. Car 56 topped the hill and the sky ahead was a solid glow of light from the buildings of Bahgdad-By-The-Bay. But the fog obscured any details beyond the limits of the brilliant headlight. On either side of the police cruiser, only the lights of vehicles running close to the east and west edges of the green and blue lanes could be detected.

The white lane traffic, with its 100-mile-an-hour speed limit, was lost in the fog as was most of the traffic in the green 100-to-150 mile an hour lane. To the left, the 300-mile-an-hour blue lane still carried its previous loads. Out beyond the vision of the police cruiser, huge flashing amber and then amber-and-red lights were in action in the ultra high speed yellow lane, warning drivers to slow down and shift back to the blue. Barriers had risen out of the crossovers to prevent any further traffic from moving into the yellow lane.

Again Frisco Control came on the air on police frequency. "All cars on 99 north and south. Additional information last broadcast. Video monitors to infra in one minute. Repeating, video monitors to infra in one minute."

Ben and Clay reached for their work helmets beside their seats and pulled them over their heads. Each officer flipped down the infra-red filter mask and Ben flicked a switch on the arm control panel of his seat. Above the regular headlight strip on Beulah's bow another strip, black to the naked eye, came to life and a brilliant band of infra-red light now cut through the night and fog. At the same instant, the video monitors shifted into the infra spectrum and the officers again had "eyeball" contact with the traffic.

"This is going to slow things down for a while," Ben said. "You go hit the sack, kid, and I'll take it until three."

Clay nodded and climbed out of his seat, first racking his work helmet back into place beside the seat. "Want a cup of coffee before I turn in?" he asked.

"I could use one," Ben replied.

The younger trooper turned to the door at the rear of the cab. He thumbed a switch killing the lights in the little galley just behind the cab before opening the door, then slid the door open and shut behind him before turning the lights back on.

Designed for long patrols on the thruways, that spanned the North American Continent from Mexico to the Arctic Circle, the thruway patrol cruisers were virtually self-sustaining units for their three-member crews while on the road. The tiny galley contained built-in range and oven, freezer locker and pull-down tables. Dishes, glasses and eating utensils were all of disposable plastic, eliminating the need for washing up after meals. Aft of the galley were the male crew quarters and then the huge engine room with its big Diesels for track drive and the jet and air-drive assemblies. Heading farther astern was a small but complete machine shop, while the last compartment contained the dispensary. This was headquarters for the third crew member, Medical-Surgical Officer Kelly Lightfoot, combination doctor, surgeon and nurse—and delightfully feminine.

Ferguson turned up the heat under the coffee flask racked on the range, then opened the door to the crew quarters. Double bunks were built into one wall and across the narrow passageway was the latrine and shower they shared with Kelly. During patrol, Kelly used one of the six hospital bunks in the dispensary for sleeping but the toilet and shower facilities were on a "knock before entering" basis. Clay tugged off his boots and then padded back in stocking feet to the galley to pour his partner a cup of now-hot coffee. Again he flicked off the lights in the galley before opening the door to the control cab. The glow of the city lights dimly illuminated the cab enough for Clay to make out the helmeted figure of the sergeant. He eased into the cab and set the coffee down in a recess in the arm of the senior officer's control seat. "Watch it, Ben," he warned, "it's hot."

"Thanks, Clay," Ben said. "See you at three."

Clay slid back out of the darkened cab and closed the galley door behind him. In the crew quarters, he dropped onto the lower bunk, reached up and set the alarm chrono mounted in the bottom of the overhead bunk to awaken him for his next watch at 0300, then rolled over and shut his eyes.

The muted throb of the big Diesels that drove Beulah's track assembly at speeds up to two hundred miles an hour echoed faintly through the insulated walls of the bulkhead separating the engine room from the crew quarters. The sound lulled Clay to sleep in less than a minute.

Car 56 rounded a sweeping curve in the hills and a blaze of light struck the gun-metal blue hull as the lights of the Golden Gate Causeway came into view. Ben flipped up the infra-red filters. Solid banks of mercury tubes lined the length of the Causeway, cutting through the fog and turning night into day. The great bridge was in reality a roof over the bay, five miles wide. It was lighted underneath as well as above for surface shipping that sailed under its protective cover for miles around the old Embarcadero to South Bay. NAT 99 north and south soared across the bay and sped high above the eastern fringes of the great city, angling southeasterly towards the peninsula where it once again dropped down to the surface of the land. Although it was unseen from the heights of the thruway, Ben knew that a maze of lesser elevated highways crisscrossed the city fifty feet below, carrying local traffic to interchanges leading to the thruways north, south and east out of the city. Another belt of light to the east was the five-mile swath of NAT 50, entering the city from across the continent.

He held Beulah at a steady hundred as she glided along the edges of the bay. The radio sounded briefly as Car 911 called for a wrecker and ambulance. Traffic densities continued to rise in the southbound lanes as Ben knew they would. At this time of night, traffic would be leaving the city, heading for the bedroom communities to the north and south. Traffic had been light coming into San Francisco from the Marin side. Now it would increase, and with the densities would come the problems.

The fog hung like a porous pillow over the city, muffling sounds and grudgingly giving way only to the banks of mercury tubes that lined the thruway and the city expressways and streets below. The intensities of light would hold the length of the peninsula to the southern limits of the city in the San Jose residential district. Then it would be infra driving until the fog lifted. The thruway curved gently to the right around the backwaters of the bay. Ahead, Ben saw the sweeping arches of the interchange that switched traffic from NAT 50 to NAT 99. He eased off power and let Beulah drop to a snail's pace as she approached the interchange.

Just past the merger lanes, Ben pulled the cruiser off to the left-hand service strip and stopped. Since only police and other emergency vehicles were allowed in the red lane, there was no worry about other traffic. He pulled the work helmet from his head and ran his fingers over his crew-cut hair, then fished for a cigarette.

He thumbed the transmit button on his arm panel. "Car 56 to Frisco Control."

"This is Frisco Control. Go ahead Five Six."

"I'm taking five at the 50 dash 99 interchange," Ben said. "Looks like a lot of traffic coming from across the bay so I thought I'd watch it here for a while."

"Affirmative, Five Six," the Frisco controller said. "South Frisco Check estimates white density seven hundred; green, nine fifty; blue, five hundred; yellow is closed to Gilroy. Report when you're rolling again."

"Affirmative," Ben replied. He jotted the densities on his log. The estimates meant an average of seven hundred vehicles for every ten miles of roadway in the white lane, nine hundred and fifty vehicles for each ten miles of the green for the next hundred-mile stretch, and five hundred per ten miles of road in the blue. That meant more than twenty-one thousand vehicles moving south in the next hundred miles of NAT 99; more than fourteen thousand of them traveling at speeds between one and three hundred miles an hour. Each lane was a half-mile wide with sweeping crossovers to the next speed lane. Ben wasn't too concerned about the green and white but a five hundred density in the blue on a foggy night could mean possible trouble. At least the ultra-high yellow, with its 500-mile-an-hour limit, was closed. He leaned back in his control seat and smoked quietly, keeping his eyes on the video monitors. Each screen had individual controls so that the patrol officer could monitor the ten-mile stretch of roadways he was in, or switch either to the next ten-mile block ahead or the block to his rear. Ben flicked the blue monitor to the block ahead, put the green and white on his own block. He started to cut out the yellow since that lane was closed but decided to leave it on, set for the present block.

Moisture from the fog-wet night beaded the plastic canopy of the cruiser and glistened on the roadway twelve feet beneath Ben's feet. His eyes flicked from the monitors to the racing bands of lights on either side of the police vehicle. The brilliant lights of passenger cars and cargo carriers whipped past, leaving glowing dots of reddish light from their exhausts. Amber lights flashed up from the rear in the blue lane and the massive bulk of a 500-ton cargo carrier whipped by at a steady 250 miles an hour. In the instant it vanished, the driver of the carrier must have caught a glimpse of the patrol cruiser's bulk parked beside the roadway. He flicked his running lights in a brief "hello" as he passed.

When he had finished his cigarette and coffee, Ben eased Beulah back into the police lane and called Frisco Control. "Car 56 to Frisco Control. We're rolling."

"Affirmative, Five Six," Frisco acknowledged. "The fog's getting thicker. Keep alert for any shipping that might wander off the bay. Frisco out."

Ben grinned and settled comfortably into the control seat. His fingers rested lightly on the twin control panels that lined the arms of the seat. All essential vehicle controls were mounted for fingertip use with the exception of acceleration and braking controls that were in footrest bars beneath his feet. On emergency runs at speeds in excess of 200 miles an hour, safety cocoons snapped out of the seat backs and locked both driver and assistant driver into their seats, leaving only their hands, feet and face clear. A band across the forehead kept their heads locked against the cushioned seat back. Other cocoons were located throughout the sixty-foot length of the cruiser in case a crew member was away from his or her regular station when sudden acceleration was needed.

Ben pushed Beulah up to a leisurely 75 and eased into the center of the police lane. He glanced over at the radiometer as it clicked to mile marker 2944. Out of the corner of his eye, he caught a flash on his yellow lane monitor. By the time he turned to look at the screen, the flash was gone. The senior patrolman started doing several things at once. Beulah surged forward under Diesel drive to 150 miles an hour while Ben reached over and switched the yellow monitor to the next ten-mile scanning block and, at the same time, called Frisco Control.

The screen showed a lone vehicle barreling down the yellow lane, ignoring the flashing amber and red lights and arrows indicating the lane was to be vacated.

"Frisco Control, this is Car 56. I have a vehicle in the yellow," Ben called.

"This is Frisco. The yellow is closed, Five Six. That car has no business in there. What's the location?"

Ben glanced at the radiometer. "He's past 2950 and he looks like he's wide open; probably near 2960 now."

"Get him outta there Five Six," the Frisco controller yelled. "We've been routing into the yellow around 3112 to clear traffic for 911's accident. That idiot may plow right into them."

Ben slammed into high. A bullhorn began blaring throughout the vehicle and Ben's safety cocoon snapped shut, locking him into his seat. In both the crew quarters and dispensary, similar horizontal cocoons slapped down on the sleeping forms of Clay Ferguson and Kelly Lightfoot. Car 56 lifted from the roadway on its airpad as synchromechanisms meshed both the impeller and ramjet thrusts. In five seconds Beulah was hitting three hundred fifty miles an hour and still accelerating. From the bow, piercing red emergency lights were flashing and both an outside and radio broadcast siren screamed. Beulah came roaring into the crossover to the blue lane as vehicles scattered to give her room. Still holding at close to four hundred, Ben sailed across the two-foot rounded curbing between the blue and yellow lanes and straightened out in pursuit of the racing vehicle. Ahead, the exhausts of the speeding car were visible to his naked eye. "I've got him in sight," Ben reported. "He's on air-jet lift and he's weaving all over the road. Looks like a drunk."

"Get him, Five Six," Frisco exhorted. "You can't herd him into the blue either. That's where the mess is now. Car 911, Car Nine One One, this is Frisco Control."

"Car 911 affirmative," came the reply. "We hear. We're trying to get these vehicles outta here but I've got this wrecker and a pile of junk halfway across the lane. We'll try. But stop him if you can, Five Six."

"Affirmative," Ben replied. His foot jammed to the floor and Beulah rammed towards peak speed. In seconds the cruiser was less than two hundred yards behind the speeder. Ben opened his mike on standard frequency. "You are directed to stop immediately. This is a Thruway Patrol order," Ben said. He peered at the weaving vehicle. "I repeat, you in the Cadillaire. This is a Patrol vehicle. Stop immediately."

The speeding car veered off to the right but didn't slow its speed. Ben glanced up at the blue and yellow monitors. The lights of the accident scene ahead and the shifting traffic were just coming into view on the screens.

The patrolman whipped the cruiser abreast of the speeder and then pulled ahead. Beulah was hitting 590. Ben fingered the emergency after-burner and the cruiser jumped ahead. When Beulah was one hundred yards in front of the Cadillaire, Ben touched another switch. Twin ports in Beulah's stern snapped open and a pair of flared nozzles popped out. Like a giant squid spewing inky secretion to blind its foe, a dense black cloud sprayed from the twin nozzles. Thousands of tiny, dark plastic flakes shot out under high pressure into the night air, and into the path of the speeding Cadillaire. The car plunged into the cloud and the impact-adhesive plastic slammed against the friction-heated face of the vehicle. The flakes were designed for adhesion only under heat and impact. The hurtling car created both forces and the plastic welded to the entire front surface of the vehicle, covering the driver's canopy, lights and prow, building up in a distorted mass around the nose of the car. Thousands more particles were sucked into the impeller air intake to adhere to the balanced fan blades and turn them into wildly vibrating clubs. The car veered and lost speed as the air-pad system fouled and then failed. Inside the now-blinded bubble, the driver panicked and hit the brakes the instant the wheels were back to the surface. Brake locks and bearings glowed red under the sudden friction and more of the plastic particles built up along the underside of the Cadillaire, coating the wheels and wheel-wells in a steady built-up mass of welded plastic until the wheels could no longer turn. A rear tire smoked and then blew. A second later the car rocked to a halt.

The moment the impellers of the Cadillaire fouled, Ben whipped Beulah to the left, angling for the outer railing of the lane. He fired all retrojets. Less than five miles ahead was the barrier that blocked the lane to allow traffic to be diverted around the cargo-passenger accident.

Ben, Clay and Kelly momentarily blacked out under the force of ten gees as Beulah lost speed. The cruiser dropped to her tracks and brakes added to the retrojet effect. Sliding like a mammoth on ice, Beulah shrieked to a stop less than a hundred feet from the barrier. The safety cocoons snapped open.

Before Ben could get the cruiser turned around and headed back to the stalled Cadillaire Clay was out of his bunk and in his seat in the cab. "What's up?" he asked.

"Speeder," Ben snapped, "probably drunk." He flicked to intercom.

"Kelly," he called, "you O.K.?"

"I'm fine," Kelly replied. "You need me, Ben?"

"Better be ready," he replied, "I think this one's a drunk and I want him tested right now if he is. Also, he might be off his rocker. Stand by, princess."

Ferguson was down the steps from the cab deck to the side hatch, waiting for Ben to bring the cruiser to a halt. His helmet was on and he had buckled a pistol belt around his blue uniform coveralls.

"Frisco Control, this is Car 56," Ben reported. "We got 'em but you better get a surfacing and vacuum clean-up crew out here. We had to 'stop cloud' him and we dug up a little road getting ourselves stopped."

"*Madre de Dios*," Car 911's patrolman broke in, "I theenk you never stop. I weel light candles to the Virgin for you, Five Seex."

Ben grinned at the Spanish accent. NorCom's officers were drawn from the three nations of the North American Thruway Compact, Mexico, the United States and Canada and the teams were intermingled from one end of the continent to the other.

"Gracias, amigo," he called back, *"de nada."*

Ben brought Beulah to a halt with her bow aimed at the Cadillaire. In the yellow glare of the headlight, a man was staggering around the front end of the vehicle, pawing at the soft mass of warm plastic molded to the front of the car. "Check the car, Clay," he called as he headed for the man on foot. One of the inviolate laws of the Thruway was that no one but a NorCom officer or worker ever stepped out of his or her vehicle on a Thruway without express permission of an officer, except in the case of fire or explosion. At speeds from one to five hundred miles an hour, a pedestrian's life expectancy could be measured in milliseconds.

Ferguson moved to the side of the car and flashed his light through the open driver's hatch. A woman sat in the front passenger seat and another couple were in the rear seat.

Ben approached the wavy-haired blond man at the front of the car.

"You the driver of this vehicle?" Ben asked.

The man spun around, a silly grin on his face. "In a manner of speaking, you might say that t' be more correct officer, I WAS the driver of this now-thoroughly fouled-up Caddy."

Ben eyed the man. The driver, dressed in a dinner jacket, pulled at his collar, knocking his tie askew. A jewel-studded watch flashed in the lights of the police cruiser as the man ran his hands through his hair.

"May I see your driver's permit, please?" Ben asked.

"Oh, come off it, officer," the man smiled and slumped against the front of the car. "We had a fine lil' run there for a while and you won. Not fairly, but you won, nevertheless. Good show. But let's not get stuffy about it, eh?"

"I repeat," Ben said in a level tone, "show me your permit. This is a Thruway. I am a Patrol officer. You have violated the law. And this is no game."

The tall blond stared owlishly at Ben, a half-amused smile on his lips. "You really are going to try and be stuffy about this, aren't you?" he queried.

Ben's mouth tightened. "Kelly," he called over the helmet intercom.

"I've been listening, Ben," the medical-surgical officer replied. "Bring him in. I'm ready for him."

Ben reached for the man's arm. "If you'll just come with me, mister."

The man yanked his arm from Ben's grip. "I'll thank you to take your han's off me, officer. I'm no common criminal, nor do I intend to be treated like one. That's the trouble with you public servants. Give you a little authority and you think you can treat anyone like a public enemy." He straightened himself up with a dignified air that was marred by a sudden loss of balance that sent him stumbling into Ben's arms. "Sorry," he muttered. "Must be all this fresh air. Not used to it in such big doses."

Ben hauled the driver upright and turned him so that he was facing down the roadway in the direction of the barrier a mile away. He pointed towards the barrier and the traffic moving from the blue to the yellow lane.

"See that," Ben asked. The man nodded mutely. "Do you have any idea how fast you were traveling?"

The driver blinked and shrugged. "Oh, three fifty, maybe four hundred. But I had perfect control, absolutely perfect control," he replied.

Ben snorted. "I don't know if you have any idea how long it takes for a vehicle to come to a complete stop from four hundred miles an hour. For your information, you were traveling much closer to six hundred than four hundred. In any case, five seconds more and you would have slammed through that barrier and killed yourself and everyone in your car. That's bad enough, but in all probability, you'd have taken along a half dozen innocent occupants in those other cars."

"This is the yellow lane," the driver cried indignantly. "They have no business moving slow as that in this lane."

"And if you had an iota of brains in your head," Ben retorted, "you'd have seen the signals ordering you off the yellow lane forty miles back and you'd have obeyed my orders to stop. Now come on."

He took the man by the arm and led him around to the rear of the cruiser where Kelly had lowered the ramp leading into the dispensary. Kelly was waiting beside the surgery table, hypo poised. Beside the table stood the cruiser's diagnostican. The compact device was capable of analyzing virtually all known human ailments and diagnosing every possible bodily injury. At the sight of the table and equipment, the blond man stopped and pulled back in Ben's grip.

"What's this?" he demanded.

"We have to run a blood-alcohol test," Ben replied. "Now if you'll just lie down on —"

The young man began struggling. "Oh no you don't," he yelled. "I'm not going to be subject to this kind of treatment. You'll hear about —"

Kelly had moved to his side and with a deft movement, slipped his sleeve back. She pressed the hypogun briefly against the skin. The man slumped in Ben's arms.

"Get him on the table," Kelly ordered. Ben heaved the inert body onto the table and Kelly made the necessary attachments. A blood analyzer needle went into an arm vein and then Kelly punched a series of buttons. Inside the machine, muted clicks indicated the data was being punched onto tapes. One copy of the tape remained sealed in the machine until the end of patrol when it was opened by a reviewing board. Another copy spewed from the key-punch orifice.

Kelly read the tape. "Two point eight five seven," she said. "This guy's so drunk he should be dead." Ben nodded grimly. "Bring him around, Kelly."

She picked up another hypogun from a rack and sprayed it into the man's bared arm. In a moment his eyes flickered and then opened. He blinked and tried to sit up and then retched. Kelly slapped a pan under his chin a split second before he vomited.

When the spasm had passed, the man sat up. Ben looked at him with disgust.

"You want something for that hangover?" he asked. The man nodded. Kelly fired another hypo into his arm and seconds later his face brightened. He smiled at Kelly.

"Great stuff, that," he said. "Should keep Florence Nightingale with me on all parties."

"Now that you can think straight," Ben said, "let's get this on record. I'm Patrol Sergeant Ben Martin. You are in the dispensary of Thruway Patrol Car 56 and I now formally tell you that you are under arrest. I am charging you with driving while under the influence of alcohol, reckless driving, ignoring instructions of the Thruway Authority, ignoring the lawful orders of a Patrol officer and leaving the confines of your vehicle while on a Thruway. I further warn you that anything you say can be used in evidence against you in a court of law."

The man stared up at Ben in amazement. Suddenly he began to laugh.

"Why you really think you're going to arrest me," he said with a chuckle. He arose unsteadily from the table and grabbed for support. "This is quite ridiculous, you know, but I suppose it is my fault. You obviously don't know who I am."

"No, I don't," Ben admitted, "but that's what I've been asking you for the past ten minutes. Now may I see your driver's license, please?"

"By all means, officer," the blond man said with a pleasant and confident laugh, "by all means." He fished his wallet from a pocket and handed it to the patrolman.

"Please remove your license from the wallet, sir," Ben requested. The man stopped laughing and stared at Ben's craggy face for a moment, then slid the metallic driver tag from the wallet and handed it across.

"There you are, officer," he said. "Now you know. Kevin Shellwood. That's who I am."

Ben took the license and pulled his citation book from a pocket. He slipped the tag into a pocket of the citation book and unclipped a stylus from his top coverall pocket.

"Hey, wait a minute," the blond man protested. "Maybe you don't understand. I'm Kevin Shellwood." He peered at Ben's unmoved face. "Perhaps you've heard of my father. Quentin Shellwood? Shellwood Electronics? Chairman of the Continental Bank. President's right han' man? I'm his very own, lone and beloved son, tha's who I am."

Clay appeared at the door of the dispensary. "Ben, what do you want me to do with those other people in the car? They're pretty loaded."

"Be with you in a minute," Ben said, writing on the citation pad.

"Now hold on there, sergeant," Shellwood protested. "Perhaps I did get a little out of line, but there's no need for all this difficulty. Really there isn't." He fumbled with his wallet and withdrew a sheaf of bills and laid them on the surgery table.

"Now let's be reasonable about this little matter," he said. He pointed to the pile of bills. "There's at least six thousand there. Now I know you ladies and gentlemen are notoriously underpaid public servants. Risk your necks and all that sort of thing, very little to show for it. This would make better than two thousand apiece and if you'll just give me your names, when I get to L.A. I'll double it. In cash, of course."

The three crew members eyed Shellwood. The man moved forward with a confident smile. "I'll just pick up my things now and get out of your way, officer. The girls have enough cash to get us a cab to L.A. No hard feelings, old boy."

He stuck out his palm to shake Ben's hand. In the next instant a handcuff snapped on his wrist, he was spun around and the second cuff snapped on his other wrist behind his back.

Ben spun Shellwood back around. "Mr. Shellwood, I now further charge you with attempting to bribe three officers of the Thruway Patrol."

Shellwood's face dissolved. "You're making a terrible mistake, officer," he cried. "You have no idea how bad a mistake you've made. You know you can't make this stick. And my father is a very vengeful man. This will mean your jobs, you know that, don't you?"

Ben ignored his protestations and frisked Shellwood, removing his belt, lighter, watch and necktie. In the presence of the other two crew members, he counted the cash, then put the entire contents of the wallet and Shellwood's other possessions into a sealed plastic bag. He wrote a detailed receipt for the items and stuffed it into Shellwood's coat pocket.

"Clay," Ben ordered, "take Mr. Shellwood forward and lock him up. Then meet me at the car and let's get this mess cleaned up."

Ferguson took the stunned Shellwood by the arm and led him out of the dispensary and around to the front of the cruiser. The trooper palmed a panel and a door opened in the bow. Inside were two fold-up bunks, a toilet and water tap. There was no handle on the inside of the door. A single light was recessed into the ceiling next to a small covered grill. Ferguson unlocked the cuffs and shoved Shellwood into the brig and slammed the door before the man could protest or turn around.

Clay walked back to the disabled Cadillaire where Ben was talking with the three occupants. "Now you just stay in there, Mr. Hawks, until we get this vehicle off the roadway. Then you and the ladies can leave. I'll see that you get transportation to the nearest 'phone. But don't get out of that car or I'll have to put you under arrest, too."

"But what about Kevin?" the man in the back seat asked.

"Mr. Shellwood is under arrest," Ben replied, "and he'll have to remain in custody for the time being."

"Why that's utterly ridiculous, officer," the woman in the front seat protested. "You just don't arrest Kevin Shellwood like a common criminal. Why, he's a . . . a gentleman!"

Ben leaned down and looked intently at the woman. "M'am" he said quietly, "I have no doubt that Mr. Shellwood's a gentleman. But Mr. Shellwood is also the gentleman who in another five seconds would have killed you like a bug squashed against a windshield." He pointed to the barrier ahead.

The woman gasped and put her hand to her mouth, then lapsed into ashen-faced silence.

Ben walked around to the front of the car and jotted the license number on his citation pad. Before returning to the cruiser, he reached into the car and removed the car registration tab from its rack on the dash.

Back in Beulah's cab, he got on the radio.

"Frisco Control, this is Car 56. Send me one wrecker and permission for three passengers to ride wrecker to nearest off-road 'phone. Also, I have the driver in custody on 'DWI' and assorted other goodies. Where shall I take him?"

"Car 56 this is Frisco Control. Wrecker on the way with O.K. for riders. Where does your driver reside?"

Ben glanced at the license.

"1421 Claremont Drive, Malibu Beach, California," he replied.

"Have you checked for previous violations?" Frisco asked.

"Not yet."

"Check it out and then report back."

"Affirmative," Ben replied. He slipped the driver's license from his citation pad and inserted it into a slot in the cruiser's instrument panel. The vehicle registration tag went into an identical slot beside the first one. Then he pushed a button above each slot. A magnetic reader and auto-transmitter scanned the magnetic symbols implanted in the tags. The information was fed simultaneously to Continental Headquarters records division at Colorado Springs. There, computers compared the information on the driver permit with all previous citations ever issued by a NorCom unit. The vehicle registration tag also was checked for validity.

A light above the registration slot flashed green, indicating the registration was in order. But the light above the permit slot turned amber, indicating a previous but minor violation.

Barring the current difficulties that Shellwood was in, had the registration light turned red, showing improper or illegal registration, he would have immediately been arrested. The driver permit light could only have been green or amber. Green would have meant no previous convictions. Had he had two such violations he would not have had a valid license. It would have been a forgery and brought equally quick arrest.

In this age of five-hundred-mile-an-hour speeds, leniency led only to death. NorCom courts, that acknowledged no state or national authority within the three nations of the compact, were absolute in their justice. One major violation and a driver was barred from the Thruways for life, possibly fined and jailed as well. Two minor violations brought the same result. If convicted, Kevin Shellwood was through driving for life.

Ben called back to Frisco.

"He's got a previous minor," he reported.

"Take him on into L.A.," Frisco Control replied. "The fog's lifting now and you can make good time down the red lane. I'd take you off the board except for a really bad mess since you're almost at the end of your patrol anyway."

"Thanks," Ben said with a touch of bitterness, "if we hurry, we might get him down there and through court before we have to pull out again. This shoots any rest period for us. By the way, this guy says he's a wheel and that we can't do this to him."

"They all say that," the Frisco controller laughed. "Who is he?"

"Kevin Shellwood," Ben replied.

"Shellwood Electronics?" the controller asked.

"The old man's son," Ben replied.

"He really IS somebody," Frisco replied. "You've bought yourself a bundle of trouble tonight. Lots o' luck."

"Yeah," Ben replied thoughtfully, "thanks."

Ten minutes later the lights of a bulky NorCom wrecker cut down the police lane and swung to the left, guided by the flashing warning lights on Beulah. Clay watched with a grin as the two evening-gowned women and their well-lubricated escort gingerly stepped up into the hatchway of the wrecker. The wrecker's stern crane clamps swung out and locked onto the Cadillaire. The entire vehicle was lifted into the air and another magnaclamp slapped it tight against the rear of the wrecker. The vehicle swung around and headed back up the emergency lane.

Clay swung up into the cab and slid into his seat. Ben was still writing up his report. The galley door opened and Kelly came into the cab and plumped down on the jump seat between the two troopers.

Ahead, the last of the earlier accident debris had been cleaned up and traffic once again was moving along the blue. Car 911 rolled across the median and alongside Beulah. The senior trooper flicked the car-to-car radio.

"Real nice work, Ben," he said. "That could have been a mess if you hadn't corraled them before they hit the barrier."

The younger Mexican trooper cut in. "I think maybe you ride rodeo sometime, amigo," he said, "like, what you call it—bulldozering!"

Ben smiled. "More like calf-roping. Well, we've got our calf thrown and tied. Trouble is, that now this little calf is beginning to look more like a tiger cub."

"So I heard," 911's senior officer said. "Sorry it had to be one of those but if there's any question, we'll back you to the limit."

Ben waved. "Thanks. I think we'll roll it now. Will you take a look at that roadway where we stopped? I was serious when I told Frisco it might be torn up a bit. If it is, better get a surfacing crew on it tonight."

"Right," the other officer replied. "We'll handle it. And thanks again."

The other cruiser pulled away and rolled slowly to the scene of Beulah's gut-rending halt. As Clay put Beulah in motion he saw the side hatch open and one of the 911's officers start an inspection of the paving surface. Even light corrugations could cause serious problems to vehicles traveling in excess of three hundred miles an hour.

Clay angled Car 56 back to the center police lane and again headed south. Ben completed his report and laid his clipboard down. Clay had the cruiser rolling just over a hundred.

"Kick 'er in the pants, kid," Ben said, "but keep her in track speed."

Clay pressed the foot feed and Beulah lunged up to 190. He eased back on the acceleration and held the car at 195, just under the speed where the synchrosystem would cut in the fans and jets—and would require safety cocoon driving.

The copper-haired medical officer looked at Martin. "What happens now, Ben?"

Ben settled back and fished out a crumpled pack of cigarettes and passed them to her. When they had lighted up, he smoked thoughtfully for a couple of minutes before answering.

"We take our boy into L.A.," he said, "turn him over to the prosecutor and from then on it's out of our hands."

Kelly hunched forward on the jump seat, chin in hands and peered into the dark of the Thruway.

"I hope it's that easy," she murmured. "I just hope it's that easy."

They were out of the Bay area fog belt and traffic had reopened on all lanes. Beulah rumbled along at a steady 195, moving faster than the white and green lane flow but still under the thundering speeds of the blue and yellow lanes to the left. The radiometer clicked off better than three miles every minute and at fifty-mile intervals, the cruiser flashed under arching crossovers that carried traffic across the police lane from green to blue and back. The radio chattered with instructions for other patrol units along the Thruway. Just north of Bakersfield, Beulah rolled past another cruiser, idling along on patrol at a mere hundred miles an hour. Normally, one car never passed another without specific leap-frog orders from Control. But Car 56 was officially off the Patrol board, barring major emergency. Dawn was beginning to lighten the eastern skies and already densities were building up for the work day in the sprawling metropolis of the Southland. At mileage marker 3300 control shifted from San Francisco to Los Angeles. The Los Angeles Controller came on the air at 0400 with the density reports for all Thruways leading into the nation's largest city.

Kelly went back to her dispensary for another couple of hours sleep, first stopping in the galley to put a fresh pot of coffee on the range for the two troopers.

Ben had taken over controls and Clay pored over the Patrol records, making final entries and notations for the engineering crews that would take Beulah for a checkup at the Los Angeles Barracks.

Suddenly the floor beneath their feet resounded to a pounding from the brig. Clay swung over and lifted the hatch that covered the grill in the ceiling of the detention cell. Kevin Shellwood peered up at them.

"Is the condemned prisoner allowed to have a final cigarette before the execution?" Shellwood asked.

Clay pulled out his pack and lighted a cigarette and then handed it down through the grill to the prisoner. "Comfy down there?" he asked.

Shellwood dragged gratefully on the cigarette. "Oh, it's delightful, just delightful," he said. "Although I can't say much for your taste in interior decorating. How about sending the hostess up to keep me company? Now that's one bit of decoration on this tub that I really approve of."

"Sorry," Clay quipped, "the hostess doesn't mingle with steerage passengers. Next time, travel first-class. Come to think of it, the only traveling you'll be doing from now on is as a passenger."

He started to close the hatch. "Wait," Shellwood cried. "You two still determined to take me in?"

Ben glanced down to the open hatch. "We have no choice, Shellwood. I'm sorry."

Shellwood shrugged. "Oh well, have your fun now. I'll have mine when we get to your headquarters. Thanks for the cigarette. I may be able to do the same for you in a day or so."

Clay slammed the hatch. "I'd like to put my foot right through his smug face," he growled. "That kid is due for a big surprise when he shows up in court."

"Don't let him get you," Ben said. "His kind have always existed. They think that money and influence is the answer to everything and that laws are made for everyone else but themselves.

"As far as traffic laws are concerned, I guess before the Thruways, a man with enough money and power could buy his way out of jams. Every state had different traffic laws and you had a thousand different enforcement agencies, from town constables to individual state troopers. The worst part though, wasn't in the enforcement of the law—it was in the administration."

"How so?" Clay inquired.

"Well, you get the same thing today off the thruways and on state highways where we have no jurisdiction," Ben replied. "No matter how diligent a cop is about enforcing the law, in the final analysis it's up to the judge to determine the degree of punishment. And with all kinds of pressures on local judges and each with his own interpretation of what the law means, a driver charged with reckless operation in one state could get off with a twenty-five dollar fine and suspended sentence and lose his license and get socked a couple of hundred bucks in the next state. And probably pull thirty days in jail.

"The same thing applies depending on who the defendant might be. A judge who lives in a community and is either elected to office or appointed at the pleasure of the current administration sometimes thinks twice before he throws the book at the mayor's son. But he doesn't have a bit of compunction about throwing the same book for the same charge under identical conditions at some poor slob who hauls garbage for a living."

Even though Car 56 was officially off patrol, force of habit kept Clay's eyes flicking to the monitor screens in front of him. All lanes were filling fast in the early summer dawn and already it was light enough to make out the shapes of the speeding passenger cars and cargo carriers. Most of the traffic now was passenger vehicles heading into the heart of the city to places of work. The big rigs did their traveling at night to hit the early morning dock loadings and there was just a scattering of trucks in the green and blue lanes.

He made an adjustment on his blue monitor to throw it into the block ahead and sat back. "One thing I remember from the academy," he mused, "was that no NorCom judge shall sit in judgment if he has had less than ten years of actual Patrol duty. That makes real sense, when you think about it. A guy who has had to help scrape some citizen off the side of a cargo carrier, has no illusions about the safety of the road when an idiot gets turned loose behind a Control column."

"That was the main purpose in setting up the NorCom courts," Ben said. "We have no political allegiances to either state or country; our appointments are for life or unless we're fired for real cause, or resign.

"Also, it's kinda nice to think that when you get too old to wheel one of these tin buckets around, there's a chance to move up the ladder to a quieter and better paying slot. Not that I'll ever make it," he added with a rueful smile.

The radiometer clicked to 3510. They were inside the city limits of Los Angeles and Ben eased back and let Beulah drop to a hundred. Overhead, two heavy Thruway air survey jet 'copters lazed along a hundred feet above the jammed Thruway, watching the flow of traffic and sending a running report to Los Angeles. Amber lights began flashing alongside the blue lanes, indicating overcrowding ahead and signaling a fifty-mile an hour slowdown for all vehicles until the jam cleared. Barriers rose out of the crossovers to prevent more green speed cars from moving into the already congested lane.

Suddenly the radio came to life. "L.A. Control this is Chopper 77. There's a light-over-dark green sedan cutting back from the yellow at about Marker 3540. He's going too fast."

L.A. Control cut in. "Car 412, this is L.A. Control. What's your location?"

"This is Four Twelve. We're at 3568."

"Drop back and cut into the blue and stop that vehicle, Four Twelve," L.A. Control ordered. "Chopper 77 continue to monitor."

"That guy's gonna kill somebody," the officer in the aerial cruiser shouted. "Get back fast, Four Twelve. He's cutting through traffic like a maniac."

Ben reached down and opened the brig hatch. "Lie down on your bunk, Shellwood," he ordered. "Don't argue or you'll be pasted against the bulkhead in just two seconds."

The prisoner threw him one quick look and then leaped for the bunk.

Ben slammed the hatch and flicked his transmit switch. "L.A. Control this is Car 56. We are now at 3515. Shall we pursue?"

"Affirmative," Control snapped back.

The bullhorn blared throughout the car as Ben slammed all drives full forward. Safety cocoons snapped shut on both officers in the cab and around the reclining form of the prisoner in the brig bunk. Aft, in the dispensary, Kelly made a leap for a corner cocoon at the first note of the bullhorn. With a screaming roar, Beulah's lift fans and jets thundered into action and rocketed the 250-ton police cruiser down the emergency lane.

Overhead, the two police air cruisers were hanging over the dense mass of traffic in the blue lane. "Car 56, this is Chopper 42. Watch yourself when you come into the blue. There's no room for you at the crossover. Pick your own hole in the median."

"Affirmative," Ben replied. "Where is the subject vehicle now?"

"He's at about 3555."

"I have him on the monitor, Ben," Clay said.

"Five Six this is Car 412. We're coming north. Watch out for us."

"Affirmative," Ben called out.

"Watchout, you fool," the voice of the air patrolman screamed. "That does it."

Five miles ahead of the hurtling police cruisers, a billowing ball of black smoke and red flame blossomed into the early morning sunlight as the speeder slammed into a jam of other cars. One explosion followed another in rapid succession until the entire blue lane seemed to dissolve into a blanket of fire and smoke. Ben cut power and punched the retrojets and Beulah came slamming back down onto her tracks at two hundred miles an hour and then continued to lose speed.

A mile away, Car 412 came rushing into view, losing speed and turning at the same time that Ben began twisting Beulah towards the carnage on the highway up ahead.

"L.A. Control this is Chopper 77. Get us everything you can. We've got a major fire and major injuries and fatalities. Divert all blue and yellow. Clear 'em fast."

The two ground cruisers eased their way through the mass of halted and burning vehicles, trying to reach the heart of the holocaust. In the dispensary, Kelly unshipped the three collapsible auto-litters racked beside the rear ramp, then slipped on her work helmet and rolled her mobile field kit to the door.

Thick, oily smoke covered the entire scene, blinding the officers as they tried to probe their big car into the lane. The quiet morning air held not a breath of breeze to dispel the smoke.

"Choppers this is Car 56," Ben called. "Can you get low enough for your fans to blow some of this smoke away?"

"We'll try," came the answer, "but it'll spread the flames, too."

"Foam it at the same time," Ben called. "We've got to see what we're doing."

More explosions ripped the air and a huge chunk of metal came flying out of the smoke and slammed off the impervious hull of the police cruiser. Clay had already left his seat and was standing in a retractable fire control turret rising out of the engine room. The cruiser's foam nozzles were already out.

A smashed car blocked Beulah's way and Ben pivoted the huge cruiser to the left.

Subconsciously, he heard L.A. Control ordering cars, choppers, wreckers, fire equipment, ambulances and hospital units into the area. Three cruisers working NAT 99 north within a fifty-mile radius of the disaster already had crossed the half-mile wide divider and were racing to the scene.

Flames erupted from out of the smoke ahead of Beulah and before Ben could give the order, Clay had the fire turret up and was laying a blanket of foam on the fire. The smoke began to billow and suddenly there was a clear view through the wreckage as the two police jet choppers hovered and turned their big blades on the fire.

To his right, Ben saw the other police cruiser a hundred yards away, spewing foam over the burning cars and pools of jet fuel burning on the Thruway. The two choppers maneuvered into position above the ground cruisers and kept blowing the fire away from the slowing police cars.

A figure burst out of the wall of smoke and flame ahead and ran staggeringly towards the cruiser, clothing in flames.

"Clay," Ben yelled, "hit him."

In the fire control turret, Clay slammed a valve back to minimal pressure and aimed the nozzle at the flaming figure. A thin stream of foam struck the man, knocking him down. He lay on the ground, writhing in pain. Ben brought Beulah to a halt.

"Kelly," he roared, "open it up. I'm going out and bring one in."

The trooper jumped down the steps and out the side hatch of the cruiser to be met by a roaring wall of heat. Above him, the chopper pilot kept a steady air current blowing the flames away from the car as Ben waded through the oxygen-absorbing foam to the body of the fire victim. He reached down to grab the man's body and bumped into Kelly fighting her way to his side with an autolitter. Ben started to say something and then just heaved the body of the man onto the litter and shoved both Kelly and the litter back towards the cruiser. The motor-driven litter with its radio homing device, rolled through the muck to the rear ramp of the cruiser, with Kelly riding the rear bar. Ben fought his way back to Beulah under a covering canopy of foam from Clay's turret.

He slammed the door shut and scrambled back up the steps and into the control seat. Four more choppers arrived overhead and began dumping bentonite and foam on the shards of burning wreckage.

He moved Beulah ahead through the maze of smoldering and foam-covered vehicles.

"Car 56 to Chopper 77," he panted, "how close are we now to the center of this mess?"

"Hard to say, Five Six," the chopper officer answered. "Looks like you're about a hundred yards north and a couple of hundred west. But this thing spread over into the yellow after that first impact. We've got a lot of equipment in here now. Looks like the fires should be out in another minute or two."

"L.A. Control to Cars 56 and 412. Hold your positions and prepare to assist ambulance and wrecker rescue operations," came the next order. Ben acknowledged and brought Beulah to a halt again, another hundred yards closer to the heart of the disaster. The smoke had cleared considerably to a thin haze and a quarter of a mile south of Car 412, Ben could see two other cruisers working their way towards them, squirting foam on the last wisps of fire that flickered from burning cars.

"Secure your turret, Clay," the senior trooper ordered, "then let's see what we can do in this mess."

The fire turret retracted into the hull and Clay moved up to the cab. As he was donning his helmet, Shellwood pounded on the brig hatch. Ben lifted the cover.

"What's happening, officer?" The frightened face of the prisoner peered up at him. "I heard the explosions and then it got hot as hell down here. What's going on?"

Ben glanced at his partner. Clay nodded.

"There's been a major accident, Mr. Shellwood," Ben said. "We've got people hurt, dead and dying all over the thruway. Both Trooper Ferguson and myself will have to leave the car to assist. I don't like leaving you in there with no one to move the vehicle or protect you if anything else should happen, although I don't think it will. Now, I'll let you out of there temporarily, Mr. Shellwood, if I have your word that you will not try to escape from custody. I might point out that it would be a very foolish thing for you to attempt, in light of the other charges against you and that it would be very easy for us to find you again. Do I have your word?"

"You have it, I swear it," Shellwood answered earnestly. Ben nodded at the junior trooper. Ferguson slid down the steps and out the hatch. He opened the door of the brig and stood back. Shellwood stepped out and stopped dead, his face ashen as he surveyed what looked like a scene from Dante's "Inferno."

Clay took him gently by the arm and led him around to the cab entrance and helped him up the steps.

Ben was buckling his helmet chin strap. He indicated the jump seat between the two control seats. "Sit there, Mr. Shellwood and don't touch anything or attempt to leave this cab. The only exception to this order is in the event that there should be another explosion and fire would again come close to the car. In that case, you may go back through this door," he indicated the entrance to the galley, "and follow the passageway back to the dispensary where Officer Lightfoot will give you further instructions."

Shellwood nodded and sat down, staring out through the canopy bubble at the terrible scene. Ben jumped down the steps and out the hatch. Clay hesitated and then tossed Shellwood a pack of cigarettes. "Here," he said, "the matches are on the arm of my seat." He followed Martin out the hatch.

The heat, along with the smoke, had abated. Underfoot was a thick scum of foam and oil. The two officers skidded and slipped around to the rear of the cruiser.

"Kelly," Ben called on helmet radio, "open up and send out the litters."

A second later, the dispensary ramp flipped open and the three auto-litters came rolling out, homing on the beacon signal in the patrolman's helmet. Kelly waved and turned back to the still form on the surgery table.

"Might as well start close and work our way out," Ben said, indicating the nearest of the smashed and smoldering vehicles.

The two troopers plodded through the muck with litters trailing behind like trained elephants. The closest vehicle was turned on its side. Clay clambered up and peered into the smoking interior. The charred bodies of two men lay huddled against the far side. Clay eased back to the ground. "Two dead," he said, "none alive."

They threaded their way around a pile of smashed pieces, kicking some out of the way to make room for the litters. Next was a tangled heap of what appeared to be two or possibly three cars. It was virtually impossible to distinguish the parts of one from the others. The topmost vehicle held the smashed and burned bodies of three more men. Ben squeezed between chunks of crumpled paneling to peer into the second car. The mangled body of a man was slumped over in the seat and there was another form beneath him. Ben squirmed farther into the window and reached down to tug at the body of the man. The body slid sideways to reveal a woman lying twisted and bleeding on the seat. Ben stretched and found her arm and let it trail through his fingers until he had her wrist. There was the faint but distinct feeling of a pulse.

He worked his way back out and surveyed the wreckage. "There's a woman alive in there, kid," he said. "Now the trick is to get her out."

Clay turned and started back for the carrier. "I'll get Beulah and we'll lift that top car."

"Never make it through this mess," Ben said. "Hold on."

Overhead, the police choppers were hovering over the scene, directing the stream of emergency vehicles arriving on the scene.

"Patrol Sergeant Martin to any chopper," Ben called. "Need an airlift immediately. We have an injured party under a pile of junk."

"This is Chopper 97," came the answer, "where are you, Martin?"

Ben pulled his flashlight from a pocket, flipped the red color shield down and aimed it in the general direction of the several hovering aircraft. One of them cut away and headed towards the two patrolmen.

"We have you in sight, Martin."

The craft came to halt above them and in the same instant, a magnaclamp descended on a cable. Clay scrambled to the top of the pile and grabbed the dangling clamp and guided it to one end of the smashed vehicle.

"Nine Seven to Four Four, get over here, Charlie, I need another lift on this one," the chopper pilot radioed. Another 'copter swung towards them and a second cable and clamp came down. Clay slapped it against the opposite end of the car and then slid down off the pile.

"Haul away," Ben called.

Both 'copters took up the slack in their cables and then with a slow increase of power, began to rise. There was the sound of tortured and torn metal being ripped apart and then the smashed car was swinging free, dangling beneath the two choppers.

"Set it down in the first clear spot you've got," Ben ordered, "and then stand by, please. We may need you again."

Clay had jumped up onto the side of the overturned bottom vehicle and was tugging desperately at the smashed door. The two 'copters backed away to a nearby open spot on the roadway and then lowered the wrecked car to the ground. They cut their cable power and the clamps swung free as the choppers moved back over the troopers.

"I can't get this door open," Clay yelled. He looked up at the clamp dangling over his head. "Give me another clamp, Chopper," he called, "then see if you can give this door a couple of jerks to swing it open. But don't pull too hard or you may drop the car on the woman."

He secured the clamp to the smashed door panel and then backed off and grabbed a jutting piece of metal for a handhold. "O.K.," he called, "try it."

The winch operator on the hovering aircraft gave a tentative fast lift. The car shivered but the door remained stuck. "Put a little slack in the cable," Ben directed, "and then take it up with a snap."

The cable drooped, then suddenly snapped upwards and the door ripped open and off. Clay made a dive for the opening before the cable had stopped swinging. The broken door made a slow arc and slammed the trooper in the back of the head as he started to kneel by the open door. Clay hurtled headfirst into the smashed vehicle. The broken door swung once more across the metallic surface of the vehicle, raising a sheet of sparks. The next instant, the vehicle was enveloped in flames.

"FOAM IT," Ben screamed to the chopper as he leaped for the burning vehicle. A torrent of foam descended from the two choppers and in the split second before the chemical blanket dropped on him, Ben caught a glimpse of a leaping figure, jumping up into the foam and towards the burning car.

The fire was out almost as quickly as it had started. Ben fought his way to the top of the car, pawing the blinding foam from his face. As he reached down to grope for Clay's form, the body of the patrolman was shoved up through the gaping door. Ben caught his partner under the arms and dragged him down from the vehicle. He laid him on one of the auto-litters and turned back to the car. The torn body of the woman was rising to meet him. A foam-covered face appeared at the opening.

"Any more?" asked Kevin Shellwood.

Ambulance crews continued to probe among the shattered pieces of vehicles spread for hundreds of yards across and up and down the blue lane and parts of the yellow. Overhead, police 'copters lifted wreckage from the roadway and deposited it in tragic heaps along the service strips bordering the police lanes. Other choppers lifted litters and swung them over to the huge hospital carriers where surgical teams worked to save the pitiful handful of survivors.

In the dispensary of Car 56, Trooper Clay Ferguson was stretched out on one of the bunks, nursing a nasty lump on his head and a queasy gut. Kelly had flushed his stomach to clear the residue of foam that he had taken into his system before Shellwood pulled him out of the wreck.

The woman victim was pulled out after Clay had been transferred to a hospital carrier. The first victim, he of the flaming clothing, was dead. His body lay in the morgue cabinet of the same hospital carrier that had taken the woman.

Most of the debris had been cleared from the roadway behind Car 56 and Ben slid into his control seat and kicked Beulah to life. The big cruiser slowly pivoted and then rolled back towards the police lane. Ben eased the car over the rounded curbing and parked. The galley door slid open and Kevin Shellwood, dressed in a set of Clay's spare uniform coveralls, stepped into the cab.

"Feel much better after a shower and change of clothes," he said. He sat down on the jump seat and eyed Ben innocently. "Got a cigarette, sarge?"

Ben fished out a pack and the two lit up silently. The trooper studied the man for a few moments. "That was a fool thing to do," Ben said. "I thought I ordered you to stay in this cab under any circumstances."

"Oh, you did indeed," Shellwood agreed amiably. "Never did take well to orders, though. As you well know." He paused and took a deep drag on the cigarette.

"As a matter of fact," he continued seriously, "I was sick unto death at what I saw. I just couldn't sit here and not do something. Not built that way. So I followed you. Good thing I did, eh?"

Ben sighed and snubbed out the cigarette. "I can't deny that. But I'm afraid that it isn't going to do you a bit of good on your other charges."

Shellwood smiled.

"Didn't expect it would with you, sergeant. Once a cop, always a cop, I've heard it said. Might put in a good word for me, though. Could mean an extra candy bar on visiting days, hm-m-m?"

"I just can't seem to get it through your head that you're in serious trouble, young fellow," Ben emphasized. "I'll put your actions on my report, and I'll see that it's noted by the proper authorities. But I warn you that it probably won't have one bit of effect on the court's action on your other charges. Apart from that, let me say that I'm personally grateful for your assistance and I'm sure that trooper Ferguson is equally grateful. But as for the rest of it, I dunno." Ben shook his head sadly.

Shellwood smiled good-naturedly. "And I can't seem to get it through your head, sergeant, that Kevin Shellwood just doesn't get into serious trouble. Hate to disillusion you and all that, but it just doesn't happen. And when we get to your bastille or wherever you're taking me, I don't want you to feel badly about what will happen then. Don't you worry about me. There are things that can be accomplished that are beyond the wildest imaginations of a simple policeman."

"Let me ask you one question," Ben parried. "Have you ever tangled seriously with the Thruway Authority before?"

Shellwood shook his head. "Not seriously, sergeant, just that little thing about improper lane crossing. Got that minor on my tag simply because it wasn't worth quibbling about."

Ben nodded. "Then let me give you some of your own advice. Don't feel too badly about what does happen when we get to Los Angeles Barracks. And no hard feelings, either."

The trooper swung around into his control seat. He glanced at Shellwood on the jump seat. "I still have your word on remaining in custody?"

The young man just nodded, not saying a word.

"Kelly," Ben called on intercom, "how's our patient?"

"A miracle has occurred, Ben," she replied.

"You mean that door knocked some sense into him," Ben quipped.

"There's even a limit to miracles," Kelly said. "Nothing could knock any sense into this dumb Canuck. No, what I meant is that for the first time in his life, his stomach is doing handsprings at the thought of food. Otherwise, he's the same wet-eared juvenile he was an hour ago." Ben could hear some mumbling in the background that suddenly was shut off. "Lie down lunkhead," he heard Kelly order, "or I'll give you an enema."

Ben chortled and shoved Beulah into gear. The car moved slowly into the police lane, threading its way through the parked wreckers and ambulances and hospital vehicles.

"L.A. Control this is Car 56," Ben reported, "en route your headquarters."

"Affirmative Car 56," L.A. Control came back "and thanks for the fast assist."

"Glad we were handy," Ben replied. "How bad is the tally?"

"Not good," the L.A. controller replied. "Right now it stands at thirty-two dead, fifteen injured. We still haven't finished digging everything out. But you're clear to head home."

Ben signed off and took a final look at the scene of the mass pileup. Television news camped in 'copters, hovering around the outskirts of the area, shooting with long lenses. All traffic was shut down in both the blue and yellow lanes and the green and white were jammed hull to hull and moving at a snail's pace past the scene of the disaster. It was now past seven in the morning and the real business rush was on. But there were going to be thousands of Angelenos late for work this morning.

As it did in San Francisco, NAT 99 soared high above and around the outskirts of Los Angeles—or at least, what purported to be the outskirts of the metropolis that spread from the ocean eastwards for one hundred twenty-five miles in one direction and was eighty-five miles across from north to south. Near the heart of the city, a ramp angled down to the right. Above it was a sign reading "Los Angeles Barracks."

Ben turned onto the ramp and Beulah glided down in a steady spiral, passing levels of other Thruways and then dropping lower to the levels of the state freeways. The ramp straightened out and then arrowed into a tunnel. Car 56 plunged into the brilliantly lighted tunnel and down into the bowels of the city. The tunnel leveled off for another mile, and then climbed back up.

As suddenly as they had entered the tunnel, they emerged into a huge cavern. Other portals dotted the wall they had just come out from and police cruisers and service vehicles were moving in both directions from the portals. Above each smaller tunnel was a lighted panel designating which thruway it led to. Ben slowed Beulah to thirty-five miles an hour and joined the stream of police vehicles moving towards the Los Angeles Barracks parking area. Another mile and they emerged into daylight and the vast terminal of the Western Division of NorCom. Ben eased Beulah into the parking area, following the hand signals of a techmech waving him into position. The tech made a chopping motion and Ben stopped the cruiser. With a sigh, he reached over and thumbed the master switch. For the first time since leaving Fairbanks, Alaska, ten days earlier, Beulah's complete power plant went silent.

"How's the patient, now," Ben called out to Kelly on intercom.

"A better man than you'll ever be," Clay answered in person as he walked into the cab. A neat surgical patch covered a small shaved spot on the back of his head.

Ben surveyed his grinning partner. "You look O.K. How do you feel?"

"Let's just say that Kelly's touch when she's ministering to your wounds is considerably lighter than when she's looking after me," Clay replied. "I don't see how that woman ever got to be a doctor. A vet maybe; a doctor, never."

"In that case," Ben said, "I'll let you turn Beulah over to the tender care of the grease monkeys and I'll take Mr. Shellwood to headquarters. See you at the BQO in about an hour."

Shellwood arose and Clay stuck out his hand. "I'm sorry you're in a jam, Mr. Shellwood," Clay said, "and I really mean that. I want you to know I'm real happy you decided to take a walk when you did." The two men shook hands.

"Glad to be of service, trooper," Shellwood replied. "Come see me on visiting days." He glanced at Ben. "Shall we go, sergeant?"

Ben climbed from the bucket seat and reached into a compartment beside the instrument panel. He pulled out the plastic bag containing Shellwood's possessions. Then leading the man by the arm, he climbed out of Car 56 and headed for Patrol headquarters.

As Ben opened the door to the headquarters building, a battery of cameras began clicking. In the far corner of the big Patrol dispatch room, teevee crews aimed their portable transmitters at the door to catch the patrol sergeant and Shellwood as they entered. Ben stood aside and motioned to the younger man to enter the room. As Shellwood entered, three men in business suits stepped forward. The older of the trio was unmistakably Shellwood's father. He grasped the young man's hand.

"Kevin," Quentin Shellwood inquired, "are you all right? What the devil is this all about?"

"Hi, dad," Kevin smiled, "I'm fine." He turned to the other two men and nodded. "Mr. Quinn, Mr. Hackmore, good to see the legal eagles on the job."

"I'm really fine, dad," Shellwood turned back to his father, "just a little misunderstanding. Nothing to get excited about."

The newsmen were crowding in, recorders and mikes thrust forward. "Do you have a statement, Mr. Shellwood?" one asked. Quinn, the older of the two attorneys, held up his hand to the newsmen.

"Mr. Shellwood has no statement to make at this time," he said. "We'll have a prepared statement for the press in a little while."

Ben indicated to Kevin to go to the dispatch desk where the officer on duty was making hand signals. The dispatcher leaned across the counter.

"Captain Fisher is waiting for you in his office, Ben. He wants you and your prisoner in there immediately."

Ben nodded and led Kevin Shellwood through the counter door towards the inner offices. The elder Shellwood and the two attorneys followed. Ben knocked on the Patrol captain's door and then entered. As the five men entered the office, Fisher, wearing the street dress blue uniform of the Patrol, arose from behind his desk. He leaned over and shook hands with Ben.

"Glad to see you, sergeant, and my personal commendation for your work in the pileup. I just got the report a few minutes ago." The captain straightened up and his face went stony as he eyed the younger Shellwood. "Is this your prisoner, sergeant?" he asked coldly, surveying the blue Patrol coveralls Kevin was wearing.

"Yes, sir," Ben replied. "Mr. Shellwood rendered some valuable assistance during the disaster and in the course of it, ruined his personal clothing. We loaned him the coveralls until he could obtain proper clothing."

"I see," Fisher said. "I assume you have a full report in writing?"

Ben laid his citation book and report sheets on the captain's desk. Fisher picked up the citation and read it carefully, then read the narrative report.

"I have called you all into my office," Fisher said when he finished reading, "to confirm for myself the charges brought against the prisoner and to make it clear that despite any so-called social status the prisoner may have . . ."

"Just a moment, captain," the elder Shellwood broke in, "my son is no common criminal and he is no prisoner, as you so grossly put it."

Fisher glared at the father. "Mr. Shellwood, you are in my office only at my invitation and not through any legal requirement. But for your information, your son is charged with a series of crimes—and I repeat, crimes—that, according to the international statutes of the Thruway Authority, are most serious in nature.

"Your son is, and will remain, a prisoner in custody of this agency until such time as he appears before a court of proper Thruway jurisdiction and is either admitted to bond, acquitted or sentenced. I hope this is quite clear."

"How dare you speak . . . " Shellwood spluttered, his face darkening in anger.

Quinn laid a hand on the father's arm. "Calm down, Quentin. You're only making things tougher for the boy. Now just be quiet and let us handle this affair." He smiled at Fisher. "We apologize for the interruption, captain, please continue."

"As I was saying," Fisher went on, "despite any protestations to the contrary, the prisoner will be processed in the same manner as any other person in custody of this Authority and charged with the same crimes by an officer of this agency. Now, if there are no further questions, Sergeant Martin will you please take your prisoner to the detention facilities and book him?"

Quinn asked, "May I have a moment to speak with Mr. Shellwood please, captain?"

Fisher nodded.

Quinn took Kevin by the arm and walked him to the far corner of the room where he conversed rapidly and in a low voice with the younger man. Shellwood nodded several times and then smiled. He turned and walked back to Martin.

"Let's go, sergeant," he said.

Martin took Shellwood out a side door of the Patrol captain's office and into a corridor leading to the detention rooms. Walking down the hall with the officer, Kevin asked, "How soon do you think I'll get into court?"

Ben glanced at his watch. "It's a little after nine right now, Kevin, I'd say that you probably will come in for a 'preliminary' sometime before noon."

"What's that mean?"

"At that time the judge can set your trial date, assuming that you plead 'not guilty' and, at the same time, he can set bond if he feels you should be freed pending trial," Ben answered.

"Is there a question as to whether he will allow bond?" Kevin asked anxiously.

"Well, that's up to the judge," Ben said. "But just guessing that in light of the fact that there were no injuries or accident involved in your case and because of what you did later on, I'd say that he'll probably allow bond."

They reached the end of the hall and Ben motioned Kevin through a door into the detention room. A Patrol sergeant moved up to the booking desk. Ben laid the plastic sack with Shellwood's possessions on the counter together with a copy of the arrest report. The desk sergeant glanced at the report and then took Shellwood by the arm and led him to an upright metallic cabinet at one side of the room.

"Please stand inside the cabinet," the officer directed, "facing in this direction. Place your hands on the two arm rests you see at your sides and grasp the knobs."

Satisfied that Kevin was in position, the desk sergeant punched a series of buttons. "You can come out now," he said a minute later. When Shellwood emerged from the cabinet, a complete body analysis had been recorded. He had been photographed, finger printed, retinal image recorded, bone and muscle structure detailed, dental work described and encephalic pattern graphed. All of the information had been simultaneously transmitted to Patrol Headquarters records division at Colorado Springs, to be taped into his file together with his license, violations and convictions. Kevin Shellwood had been booked.

The desk sergeant inventoried the contents of the plastic bag, gave both Ben and Shellwood receipts and then took Shellwood back through another door to the actual detention cells.

Ben headed back for the dispatcher's desk. The newsmen were still there, apparently waiting for Shellwood to reappear. When Ben showed up without the man, they again crowded around him. "Where's young Shellwood, sarge?" "Is it true he tried to bribe you?" "How much did he offer?"

Ben held up his hand. "Mr. Shellwood has been detained in custody of the Patrol until his appearance in court, probably later this morning. I'm sorry but that's all I can tell you at this time."

"Aw, come on, sarge," one of the teevee newsmen called out, "give us a break. We've been waiting since before dawn. You can tell us a little more than that."

Ben grinned at him and brushed the three chevrons on his sleeve. "I've put in a good many years getting these stripes," he said. "Any discussion of any Thruway violation case by an officer means automatic dismissal. Sorry, gents. I've got nothing more to add to what I've already told you." He turned his back on the crew and signaled to the dispatcher.

The grumbling newsmen gathered up their gear and streamed out of the room in search of a new lead to the story.

A half dozen other Patrol officers were checking assignments at the dispatch counter. On the wall behind the dispatcher, a mural-sized map of the western segment of the North American continent was emblazoned with lighted paths indicating the many Thruways that crisscrossed the land. Varied colored lights and symbols along the Thruways showed road conditions, repairs and other out-of-the-ordinary situations that would affect traffic on the roads. The outgoing Patrol officers made notes of the changes on their patrol logs. On another wall was an illuminated dispatch board with car numbers, the names of the Patrol crews to man those cars and their Thruway assignment. Car 56—Beulah—and her crew, wouldn't be back on the board for five days while the cruiser was given a thorough going-over by the shop crews and re-serviced and re-supplied. Three of the days ostensibly were for rest and relaxation for the crew before heading out on their next ten-day patrol.

One of the dispatchers came down the long counter at Ben's signal.

"Officer Ferguson is completing the cruiser report," Ben told him, "and he'll file our closing clearance in a few minutes. Tell him, please, that I'll be in the BOQ and also notify Medical Officer Lightfoot that I'd like to see her as soon as she is clear."

The dispatcher nodded and Ben walked out of the building to head for the transient Patrol quarters. The newsmen had vanished and only the blue coverall uniforms of Patrol officers dotted the walks leading to the various buildings of the Los Angeles Barracks. Ben waved at some friends and stopped to chat with two other officers before he got to the bachelor officers' quarters.

He stopped at the desk to register. The clerk assigned him to Room 218 and Ben walked up the stairs to the room. Sitting in the easy-chair facing the door as Ben opened it was Hackmore, the younger of the two attorneys who had met with Shellwood at headquarters.

He smiled as Ben entered. "Shut the door, sergeant," he said, "and let's have a little talk."

Ben stood in the doorway and eyed the man coldly. "I don't know what you're doing here, mister," he said quietly, "but I have a pretty good idea what you're going to say. So I'll tell you right now—get out!"

Hackmore ignored the order. "I'm not here on business, sergeant, just a social call, you might say. I might add that if you think I came to talk about young Shellwood, you're wrong. I'm not the least bit concerned about that young man's future. It's yours I'm concerned with at the moment."

Ben slowly closed the door and moved into the room. "What about my future," he demanded.

Hackmore took a notebook from an inner pocket and flipped it open. "Sergeant Benjamin H. Martin," he read, "age thirty-three, eleven years on Thruway Patrol. Graduated in upper tenth of his Academy class. Promoted to sergeant four years ago. Four citations for heroism and meritorious service. Twenty-five hours completed in work towards Master's Degree in Transportation Administration. Salary, eight thousand five hundred, annually. Unmarried. One sister, married, lives in Vermont. Brother-in-law is research engineer with Allied Computers. Parents dead."

"You seem to have gone to a lot of trouble to learn all that in so short a time," Ben said grimly. "Why?"

"You're quite right, sergeant," Hackmore smiled, "we have gone to a great deal of trouble to find out what makes you tick. In answer to your question, let's just say as I did before, we're interested in your future. It has some bright possibilities."

Ben moved across the room until he was standing directly in front of the seated man.

"Mister," he said levelly, "my future has all the possibilities that my career can offer and that I'm qualified to take advantage of. Those are the only possibilities I'm interested in."

"Oh, I wouldn't be so hasty," Hackmore said. "I can foresee a much brighter future for you. You are virtually a trained lawyer; you have sound education and training in mechanics and engineering, you specialize in administration and have demonstrated outstanding leadership qualities. All of these, plus several other attributes would make you a very valuable asset to any large corporation.

As a matter of fact, that's exactly why I am here now.

"Our evaluation of your background shows us clearly that we would be making a grave error not to employ your professional services in one of our several subsidiary organizations. And I'm prepared at this point to offer you such a position with a starting salary of say, twenty thousand a year for a starter. Plus a liberal expense account, of course."

"I just told you," Ben said, "that the only career and only job I'm interested in is the one I currently hold. Now, get out."

Hackmore rose and stood facing the trooper. "You realize that you're making a very unwise decision. I'll repeat the offer again and remind you that it is open immediately, but that it will only be open for," he paused and glanced at his watch, "the next two hours."

Ben stood aside and pointed towards the door, the muscles in his jaw twitching in his effort to hold his temper.

Hackmore shrugged and started slowly towards the door. Halfway across the room, he paused and turned back. "Oh, by the way," he said, "I forgot to mention that Allied Computers is also a subsidiary of Shellwood Electronics."

He consulted his notebook again. "I believe I mentioned that your brother-in-law is still a research engineer for Allied."

In two giant strides Ben was across the room and had Hackmore by the lapels of the man's coat. Lifting him bodily from the floor, he slammed the attorney back against the wall.

"Let me tell you something," he snarled. "That kid of Shellwood's has got more guts and decency than his old man and everyone of his rotten 'yes' men right down to the cruddy bottom of the barrel that you crawled from. The kid's in trouble, he's committed some serious offenses and he damned near killed himself and God only knows how many other innocent persons. But I think he realizes what he's done and he at least has the manhood to face up to his problem. And not all the dough that his old man could rake up can buy him out of this.

"Now as for you. If I find out that there's been so much as an eye blink in the direction of my brother-in-law or my sister, I'm personally going to find you and push your filthy mind right down into your equally cancerous guts."

Still holding Hackmore by the coat, Ben reached for the door, flung it open and heaved the attorney out of the room with such force that he bounced off the far corridor wall. The lawyer slid to the floor just as Clay Ferguson rounded the corner. The young trooper paused for a moment and looked down at the disheveled and frightened man and then stepped carefully over his legs and turned into Martin's room.

"Company just leaving?" he inquired pleasantly of the hard-breathing, red-faced Patrol sergeant.

At 1130 Kevin Shellwood, flanked by the two attorneys, stood before Thruway Authority Justice James Bell. Spectators packed the austere Thruway courtroom since the news of Shellwood's arrest had been on the vidicasts for the past two hours. At the side of the bench, the court reporter sat with headset in place, riding the gains on his taped recordings of the court proceedings. The crew of Car 56, dressed in their off-Patrol dress tunics, sat beside the Thruway prosecutor. An amber panel came to light over the judge's bench and the courtroom immediately fell silent.

Justice Bell leaned forward and addressed Shellwood.

"Kevin Shellwood, you are charged with driving on North American Thruway 99-south in the vicinity of Mile Marker 3112, this date, while under the influence of alcoholic beverages; you are further charged with reckless driving, ignoring instructions of the Thruway Authority, ignoring the lawful orders of a Thruway Patrol Officer and of leaving the confines of your vehicle while on a Thruway. And you are further charged with the attempted bribery of three officers of the Thruway Authority.

"At this point, I wish to advise you of your rights under this court. Although this court does not waive jurisdiction nor authority to the sovereign countries of the United States of America, the Republic of Mexico or the Commonwealth of Canada, you do not waive your constitutional rights as a citizen of the United States accused in a court of law. You may be represented by counsel and may at this time enter a plea to the charges. In the event you should enter a plea of 'not guilty' you are entitled to trial by jury or may waive such trial and be heard in trial by this court.

"Do you understand both the charges and your rights?"

Shellwood cleared his throat nervously and answered. "Yes, sir, I understand them."

"Very well," Justice Bell continued, "how do you now plead to the charges against you?"

"If it please the court," Quinn took a step forward, "I represent Mr. Shellwood in this matter."

"Very well, Mr. Quinn," Bell said. "Do you wish further time to confer with your client?"

"No, your honor," Quinn replied. "At this time, we wish to enter a motion for dismissal of the charges on grounds of insufficient and improperly obtained evidence."

Bell thumbed through the sheaf of papers on his bench, pausing to study one of them in detail.

"Mr. Quinn," he then said, "I have here transcripts of all radio communications between Thruway Control points at both San Francisco and Los Angeles with Thruway Patrol Car 56 in regard to this matter, together with transcripts of tapes recording conversations between the officers of this unit and the accused. I further have prints of video tapes taken during the conversations between these officers and the accused while in the dispensary of Patrol Car 56 at approximately 0100 hours this date. I find them sufficient cause for action to hold the accused. Motion denied."

Quinn flushed. "In that case, your honor, we then wish to enter a plea of 'not guilty' to all charges."

Bell made notes on the papers before him. "Very well, counsellor. I assume then you will seek a jury trial?"

Quinn nodded.

"In that case," Justice Bell said, consulting a calendar, "I will set a trial date for three weeks from this day at 1000 hours. In view of the recommendation of the arresting officer, I will further admit the defendant to bail, although under any other circumstances, I would refuse bond."

Kevin flashed a quick smile of gratitude at Ben sitting at the prosecution table.

"I will set bond at twenty thousand dollars in cash or forty thousand property. You may post the bond immediately with the court clerk."

"Next case."

Ben, Clay and Kelly got up quietly from the prosecution table and walked out of the courtroom just behind Kevin and his attorneys. In the corridor outside the courtroom, Clay paused and pulled out cigarettes and passed them around.

Young Shellwood was talking with his attorneys a few feet away. Hackmore nodded and then left them to enter the clerk's office. Shellwood walked over to the trio of officers.

"Thanks for the kind word, sergeant," he said to Ben.

"You're welcome, kid," he said. "I just wish you hadn't gotten yourself in such a bind."

Kevin laughed bitterly. "You know, strange as it may seem, at this point, I wish the same thing. I'm just beginning to find out that there are some things that your old man's money and influence can't buy for you. There are some things you have to buy yourself—no matter what the cost.

"But, what the hell, it's done now. And sergeant, remember what I told you this morning. Don't feel badly about the outcome of all this. I'll never stand trial, you know that, don't you?"

"Oh, come off it, Kevin," Ben exploded, "you know you will."

Shellwood smiled and started to turn away. "You just don't know the determination of us Shellwoods.

"Oh, and by the way, I want to sincerely apologize for your visitor this morning. I didn't learn about it until a while ago. I assure you that it will never go any further. See you around sometime."

He waved and walked back to Quinn and the two of them entered the court clerk's office.

Ben ground out his cigarette savagely on the floor. "Come on," he snarled at his crew members. "Let's go get drunk. I need a strong mouthwash right now."

An hour later, Ben and Kelly were seated in a corner booth of a cocktail lounge. Three empty glasses were in front of Ben and much of the tension and anger had drained from him. Clay had had one fast drink with them and then pulled out a small address book and began thumbing through it rapidly.

He excused himself and went to the phones. A few minutes later he returned, reached over and drained the remainder of his drink and reached for his uniform cap. "Got to run, you two. See you in time to roll."

He waved the little address book at them and rolled his eyes up in mock agony.

"So much to do and so little time to do it," he murmured as he hurried away.

Ben grinned at the departing trooper and leaned back comfortably in the deep airfoam cushions. "That kid's been up all night, worked like a horse, been under heavy tensions for several hours, and look at him. Two gets you five he doesn't get any sleep for another twenty-four hours."

"No bet," Kelly replied. She leaned back and moved closer to the big trooper. "Tired, Ben?"

He ran his hand over his head and sighed. "I guess I am, princess. I'm not as young as that kid and this business is beginning to get me. I've had some rough days since I started on patrols, but God deliver me from another one like today."

Kelly reached out and slipped her hand into his. She rolled her head to his shoulder. "You could always ask to get off Patrol, darling."

Ben smiled down at the golden red hair resting against him and gently squeezed her hand. "Sure I could. I could have been moved to a desk job a year ago if I had wanted to, but I'm not ready to be turned out to pasture."

"Oh, don't be silly," Kelly retorted, sitting up and facing him. "Of course you're not getting old. It's just that Patrol takes so much out of a person that the human body and mind can only stand so much of it. Then something's got to give."

"What about you," Ben inquired. "You've been riding the back end of these armored hearses for three years now and you get far more of the misery and pain than we do, right along with the rest of the dangers that go with the Patrol. When are you going to quit?"

Kelly looked up into the bronzed face of the Patrol sergeant. "I'll quit when you do," she said softly.

He studied her fine-boned face. His big hand came up and with tender touch, he lightly traced the lines of her cheeks and mouth. "You really mean that, don't you, Kelly?" She nodded mutely.

Ben let his head sink back against the cushions and punched the autobar for another drink.

"Look, baby," he explained, "another year, maybe, and then I'll be ready to turn in my work helmet for a vocawriter. But right now, with the Patrol expanding and the new designs in cars and engines that the industry is turning out, we're too short-handed as it is for experienced Patrol officers.

"Right now, the Thruways are designed to handle traffic up to five hundred miles an hour. But already, the new reaction engines can push well past the six hundred mark without straining and will probably go to eight hundred under stress. We've got to make modifications in both roadway design and patrol equipment. On top of that, consider how we're set up right now. We've got the Thruways with their four speed lanes. But how many drivers—especially those buying the new and hotter models—are satisfied any longer with drifting along in the white lane limits. Or even in the green. The bulk of the traffic is shifting to the blue and yellow and even the cargo carriers are hotter and are now moving into the blue.

"The system has got to be modified and that just doesn't mean raising the speed limits in all lanes. The roadways themselves have to be redesigned for the higher speeds. And there are more ground vehicles using the Thruways every day as the speeds increase. Air travel is picking up but the average man still can't afford to buy or fly an aircar, chopper or jet for the entire family when for a tenth of the cost he can get the same space and even speed, in a ground vehicle.

"We need more patrolmen, faster and better equipment—and the experienced officers to train them and work with them until they're ready to take over a cruiser by themselves. Clay is almost ready. Don't tell him this, but this is his last year on junior status. I hate to lose him but I'm recommending him for his own car at the end of this tour. So you see, I just can't walk out of the cruiser and say 'Chief, I've had it. Put me on a desk.' I'm still needed where I am, at least for another year or so. Then we'll see what the shuffle turns up."

He took a long drag on his drink and looked at Kelly. "You understand, don't you princess?"

Kelly sat with her head down, her face concealed. Without looking at Ben, she began talking.

"Ben," she said, "at the risk of losing all of my maidenly virtues, I want to ask you a direct question and I want a direct and honest answer." She hesitated and then blurted out, "Are you in love with me?"

Ben put down his glass and took her chin in his hand and raised her face.

"I love you more than anything in this world, princess," he said. Blissfully ignoring anyone who might have been watching, their lips met in a long and loving kiss.

Kelly finally sat back with a happy, glazed look on her face. Neither of them spoke for several minutes. Then the girl shook her head and smiled delightedly. "Now that that's settled," she cried, "a girl can settle down and do some planning."

She leaned over and kissed him again.

On the morning of their fifth day in Los Angeles, Ben Martin, and Clay Ferguson were again standing in front of the dispatcher's counter in the barracks headquarters. On the assignment board was the illuminated line reading, "Car 56—Martin-Ferguson-Lightfoot." In the next column was the assignment "NAT 70-E."

Both officers had their log sheets out to make notes as the dispatcher punched up the mural map and NAT 70-E on the big board.

"This is a milk run for you guys this time," the dispatcher said. "Since you've got this court hearing coming up in a little more than a couple of weeks you don't get a full run. You get 70-E to Oklahoma City, a three-day layover and then right back here on 70-W."

He picked up an electric pointer and began picking out salient trouble points on the route. There were very few discrepancy symbols on 70-E. He flicked the light at a stretch of the roadway just east of the Arizona state line.

"We've got crews working in the yellow on the outside rim just south of Kingman on the big curve." He moved the light eastward. "Gallup has been reporting some bad sandstorms and drifting sands with lowered visibility between here and Albuquerque. Other than that, she's green all the way."

The troopers picked up their clip boards and with helmets slung over their arms, headed out to the parking area where Kelly was already aboard Beulah and checking her supply inventory.

A half hour later Car 56 rolled off the line and down the incline to the Thruway entrances. Clay at the controls, angled Beulah towards the portal marked "70-E" and ten minutes later the cruiser burst out into the bright sunlight and heavy traffic of the eastbound thruway.

The patrol quickly settled down into almost humdrum existence. The weather was clear and hot and once beyond the sprawling limits of Los Angeles, the traffic thinned out to a mere eighteen thousand vehicles per hundred-mile block. Ben took the first watch while Clay caught up on some missed sleep during the Los Angeles layover. Six hours and as many hundred miles later, they switched off. Traffic was light enough for them to pull off to the service strip and stop for leisurely dinner in the tiny galley.

Outside, the mercury hovered at the 100-mark, but inside the big cruiser the air conditioners kept it a pleasant seventy degrees. As predicted, the winds blew and the sand flew as Beulah rolled across the burning hot lanes east of Gallup, New Mexico. Caution lights were flashing in all lanes and Albuquerque Control had closed the yellow from Gallup to Grants. Visibility in the blowing dust dropped to less than a half mile but the only trouble came when a huge cargo carrier tried to get out of the blue and missed a crossover. Car 56, rolling along slowly at fifty, came up on the unsuspecting carrier gingerly feeling its way down the dead center of the police emergency lane. Ben pulled Beulah alongside the carrier and flashed his red lights.

The cargo driver brought his vehicle to a halt. Ben turned the radio to standard all-vehicle frequency. "You're lost, Mac," he said good-naturedly. "I hate to tell you this, but you're right in the middle of the red." Both officers laughed at the gasp of stunned amazement on the face of the trucker. They waved to him and grinned and he returned the wave. "Follow us," Ben instructed him, "and we'll both see if we can find the edge of this road."

With the cargo carrier close behind, Beulah eased over to the right-hand curb of the police lane until Ben found a crossover. He hit his tail lights in rapid succession and aimed a side spotlight to indicate the ramp. The trucker blasted his horn in thanks as he turned off the police lane into the green.

Ben moved Beulah out and the patrol continued.

Beyond Albuquerque, the dust and sand subsided. The great Thruway arrowed mile after unchanging mile across the heart of the Southwest. Video monitor camera towers flashed by every ten miles, a turretlike Patrol checkpoint looming up from the side of the police lane every hundred miles. Beyond the outer and inner lanes were the green, reclaimed wastelands of what was once sagebrush and mesquite desert. Huge 200-inch plastisteel pipes crisscrossed the land, bringing de-salined sea water from the oceans hundreds of miles away. Nuclear reactor relay pumping stations sent the great torrents of life-giving waters surging across mountain and valleys to spill onto the mineral-rich sandy loam of the desert and turn it into the new salad bowl of the continent.

Five days out of Los Angeles, Car 56 rolled down the Patrol ramps and into Oklahoma City Barracks and a brief layover before the return trip. As the trio walked away from Beulah, service crews were already swarming over the big cruiser for a fast check out and refueling.

"Man, what a pleasure jaunt that was," Clay exclaimed happily. "First time since I've been aboard that bucket I ever really had time to get more than a half decent cat nap."

"It was a milk run, wasn't it," Kelly said, walking between the two tall troopers. She smiled up at Ben and winked. "Didn't seem like the sort of patrol that calls for very much experience, sergeant."

Ben smiled. "Just the lull before the storm, Kitten. You don't get many like this one. Enjoy it while you can."

They checked into the dispatch office, cleared the log and were assigned quarters. Clay fished in his pocket for his address book. He flipped the pages and then headed for the phones. "See you two Wednesday," he called.

"Oh no," Kelly moaned, "not in Oklahoma City, too?"

"Oh, it's not what you think," Clay called back. "There's this nice old lady I met in San Francisco. I promised her that if I ever got into Oklahoma City I'd call up her niece and drop in and then report back to the little old lady on whether her niece had grown up any since the last time she saw her. Just my bounden duty, you know." He galloped off to the phones.

Wednesday morning, Car 56 rolled back out of Oklahoma City Barracks, this time on 70-west, once again en route to Los Angeles. Clay slumped in the lefthand seat.

Ben looked over at him. "Had the nice little old lady's niece grown any?" he asked.

Clay sighed happily. "Full grown, dad. Full grown."

Shortly after the cruiser hit the outer Thruway, Oklahoma City Control was on the air.

"Oak City Control to Car 56."

Ben replied.

"Car 56, dispatcher says he had a telegram for you and forgot to deliver it before you got away. Sorry," the controller said.

"Who's it addressed to?" Ben asked.

"To 'Patrol Sergeant Ben Martin.' "

"Go ahead and open it, please," Ben said, "and read it to me. This is Martin."

"Affirmative," Oak City said. "Message follows: 'Original offer remains open for another forty-eight hours. Additionally directed to offer post of Director of Transportation. Salary unlimited. Please contact me in Los Angeles."

"Is that all?" Ben asked.

"Yep. It's signed, 'Marvin Hughes, personnel director, Shellwood Electronics.' "

Ben signed off and looked at his partner. Kelly had come up into the cab in time to hear the message.

"Ben," she said, "I'm scared of them."

"They didn't get the message," Ben said grimly. "I guess I'll have to spell it out for them, this time more emphatically."

The weather continued to hold hot and dry all through Texas and New Mexico and even the winds had died away. Car 56 rolled slowly westward, pausing once to give assistance to a disabled cargo carrier. Once again it was an uneventful trip, with Kelly catching up on her medical journals and Ben and Clay taking easy six-hour tricks in the cab and time for letter-writing and study.

A summer thunderstorm was gathering in the west when Beulah rolled into the outskirts of Flagstaff, Arizona. It was close to 1700 hours of the third day out of Oklahoma city. The traffic was light and Ben gave the word to pull up for dinner. He pulled Beulah off onto the service strip between the police and green lane and then reached for the radio. "Flag Control this is Car 56. We are out to dinner in your fair city. Don't call us, we'll call you."

"Right, Five Six," Flagstaff Control came back. "We'll send out the keys to the city and a bottle of red. Report in when you're back in service."

With speakers mounted throughout Beulah's compartments and storerooms, Control operators could reach the crew at any moment of the day or night wherever they might be in the vehicle.

Ben slid out of his seat and headed for the galley.

Dinner over, Kelly shoveled the dishes into the disposal unit and generally tidied up in the galley. Clay and Ben climbed back into their bucket seats and Ben reported Beulah ready to roll. Although it was still just a little after 1800 hours, the skies were fast darkening under the great mass of thunderheads and rain clouds moving closer from the west.

"Looks like we'll get a cooling off and a wash-down," Clay commented, pointing at the clouds.

Ben shoved Beulah into gear. "Water's always welcome out here, piped or natural."

Car 56 rolled back onto the police lane and continued westward. Fifteen minutes later, the first great, dusty drops of rain splattered against the cab bubble and a minute later they were deep inside the summer downpour. Ben switched on the headlight and wipers as the rain thundered down. He pushed the speed up to a hundred and the rain sailed off the rounded bubble much faster. Traffic was increasing in both the green and blue while an occasional car flashed by in the yellow, its headlights whipping up from behind in the rain and then winking out suddenly as it passed the cruiser a mile to the south.

At 1900 hours, Flag Control came on with the hourly density reports and weather picture. The storm, which had been moving eastward, was now stationary and the forecasters were calling for it to shift back to the west once again. Thruway predictions were for rain to the Arizona line just east of Needles.

Beulah rolled around the edge of Kingman shortly after 2100 hours and suddenly the radio sounded.

"Car 56, this is Flag Control. Just a few minutes ago Ash Fork Checkpoint reported a red and white Travelaire moving west in the yellow at maximum speed. In this kind of weather and with the repairs on the yellow west of Kingman on the grade, you might see if you can spot this joker before he gets into trouble. This might also be the same vehicle reported stolen from this city about two hours ago and believed to have been taken by a teenager. If it is, and it's the same kid we've had trouble with before, he likes nothing but speed. And he may have a girl friend with him."

"Car 56 affirmative," Ben replied. "We'll start looking for them right now."

The senior trooper swung Beulah south and into a crossover to the blue lane. He increased speed to three hundred and the safety cocoons snapped shut. Beulah's warning siren cleared the way for her as Ben tooled diagonally across the blue and into the yellow. In the left-hand seat, Clay had his eyes fixed on the monitors. Using his arm panel controls, he kept the yellow monitor switching across its three positions from the ten-mile block to the rear, to the block the cruiser was in and then to the block ahead.

Just as Ben straightened the cruiser out in the yellow Clay yelled, "There he is. He's way ahead."

His monitor was in the block ahead of them and Ben shifted his monitor to the same block. The red and white car was whipping through the blinding rain at better than five hundred miles an hour.

He slammed Beulah into high and the mighty jets mashed the crew back against their seats as the cruiser accelerated. Kelly was safely enfolded in her station cocoon in the dispensary.

Only three cars were ahead of the cruiser as it flew on its airpad down the half-mile wide, rain-slick roadway.

"We'll never catch him before he hits the curve, Ben," Clay exclaimed. "He's wide open and wheeling."

Ben glanced at the tach and speedometer. Beulah was fast reaching the six-hundred-mile-an-hour mark and gaining. "We're closing up." He flicked on the standard all-vehicles transmitter.

"This is a Thruway Patrol car. The driver of the red and white Travelaire now west of Kingman on NAT-70-W in the yellow is directed to stop immediately. I repeat, driver of the red and white Travelaire in the yellow west of Kingman, you are directed to stop immediately. This is a Thruway Patrol order."

"Ben," Clay cried, "he's almost into the curve. He'll never clear it at that speed. They haven't got the bank into the road yet."

On the monitor screens the red and white car went hurtling into the curve at better than five hundred miles an hour. The curve down the long Kingman grade was gentle but never intended for such speeds. As the two horrified officers watched on their screens, the light sportster began slewing sideways to the left, towards the outside of the curve.

The driver obviously was fighting to straighten it out with short additional bursts of power, but the combination of the centrifugal force on the light car and the wet roadway and lack of surface adhesion on air drive made it impossible. The car's left jet burst into a blaze of flame as the driver kicked the full afterburner into action in a last desperate attempt to hold the vehicle on the road. Almost in slow motion on the monitor screens, the car went whipping sideways against the guard rail, hurtled up into the air and rolled over several times in midair before vanishing from sight down the side of the mountain.

Ben was already slowing Beulah while Clay took over the radio. "Flag Control, this is Car 56. Our red and white Travelaire has just taken the rail at the Kingman curve, Marker 4280. He's down the side of the hill. Get us a chopper on the double."

"This is Flag Control. Chopper en route, Five Six, also ambulance and wrecker."

Ben fought Beulah to a halt beside the smashed railing. Rain was still pouring down. He nosed the cruiser to the edge of the road and aimed a big flexible spotlight down the side of the hill, moving the beam back and forth. It came to rest on the shattered hulk of the car, several hundred feet down the rugged mountainside.

"Let's go," Ben said quietly. "Kelly," he called on the intercom, "get on your rain suit and your kit bag, although I don't think we'll need it. Clay, you work the winch."

He slipped on his helmet and climbed down into the rain. Kelly came up wheeling the mobile aid kit. Ben opened a panel in the cruiser's nose and pulled out the end of a cable and magnaclamp. From another side of the compartment came a wide plastic web safety belt and a pair of harnesses. Wordlessly, he and Kelly slipped into the straps and then hooked the medical kit to the belt. With the belt and harnesses secured to the cable, he gave Clay the order to lower, and the cable began to pay out down the side of the cliff. Ben kept an arm around Kelly as they backed down the almost vertical face of the slope, picking their way among the rocks and brush.

A hundred feet down, they reached the body of a young girl. Ben flashed his light on her head and quickly turned it away. "Keep going down," he said softly into his helmet mike.

Just short of three hundred feet of cable were out when they reached the wrecked car. Ben called to Clay to hold them there and then inched their way to the car. It was wedged upright between two boulders. Ben turned his light inside. The driver was smashed down against the seat, his face turned to the night sky and rain was pouring over his slack, bleeding features.

Blood bubbled from his lips with his shallow breathing.

"He's still alive," Ben gasped.

Kelly was already shoving Ben aside and pushing her kit onto the seat. She whipped out a hypogun and slammed it against the youth's bared chest. "Give me your light," she snapped, "and get that chopper here in a hurry with a litter."

Ben leaned back out into the rain-swept night and eyed the sky. Only the lights of the cruiser were visible.

"Clay," he called over helmet radio, "find out where that chopper is."

A new voice broke in. "This is Chopper 115. I'm about at Marker 4275 Car 56 and I have your lights in sight. Our litter is ready to go. Where is the victim?"

Now Ben could hear the roar of the chopper's jets in the night and its huge spotlight loomed out of the rain. He unclipped his smaller handlight from his belt and aimed its red beam at the approaching aircraft.

"Got you, Five Six," the chopper pilot called.

The craft came rushing in, stopped and hovered outboard of the cruiser but not dropping lower into the gorge. "We'll have to make the lift from here," the chopper pilot called out. "Too turbulent and too dark to take a chance on the side of the hill. Litter coming down."

From the bottom hatch of the chopper the litter dropped swiftly on its cable, two small flashing lights winking at the front and back to mark it against the dark sky. It came to rest a few feet from Ben and he reached out and pulled it towards him. "Slack off," he ordered.

Kelly had squeezed into the blood-smeared interior of the car and was working around the boy's thighs. "Get his shoulders, Ben," she ordered, "and let's get him out of here fast. He's in deep shock and hurt terribly."

The officer and the girl worked the inert form out of the wreckage and onto the litter. Ben pulled the plastic cover over the litter. "Take him up," he called. "And then lower the litter back for a DOA.

"Clay, stand by to haul Kelly up," Ben directed.

Kelly had closed her kit and hooked back onto the cruiser cable. Ben gave the word and the cable began hauling her back up the muddy, rocky slope.

The instant she was back on the edge of the road, Kelly slipped out of her harness and went racing to the ramp where the litter hovered a few feet off the ground. She snapped the wheels down from the side of the litter and on command, the chopper lowered the litter to the ground. Seconds later it was up the ramp and into the dispensary beside the surgery table.

The chopper hauled up the cable, affixed another litter and lowered it back down to where Ben was waiting. The senior officer caught hold of the basket and told the pilot to haul up slowly. When he came to the level where the dead girl lay, the litter was halted and Ben gently lifted the shattered form onto the litter.

"Take it up," Ben called, "I'll be hanging on for a hand up this slope."

Inside the cruiser, Clay had come running through the car and burst into the dispensary as Kelly was wheeling the diagnostican into position.

"Let's get him on the table," she ordered. She and the trooper lifted the unconscious youth from the litter to the table and Kelly slipped a plasma needle into a vein even before attaching the big machine. She sprayed another dose of heart stimulant into the boy and turned to the diagnostican.

The boy's eyes flickered open. He stared dully at the white ceiling of the dispensary, his eyes unfocused.

"Kelly," Clay yelped, "he's conscious."

The medical officer whipped around and reached for the boy's pulse. She stared at his eyes and rolled the lids back, then quickly began making the diagnostic attachments. Minutes ticked by as the machine analyzed the damage to the injured youth. Kelly had slapped gobs of regen jelly into the superficial wounds that showed while the machine continued its diagnosis. A green light came on when the diagnosis was completed and the last of the taped data spilled from an orifice.

The boy's eyes had closed and his breathing became more labored. Outside, a Patrol ambulance came roaring to a halt and a team of medical technicians came running into the cruiser's dispensary. Wet, muddy and blood-splattered, Ben followed them into the car. While Kelly was reading the tapes, the techs were unlocking the table from the dispensary floor to wheel it out and into the ambulance.

Kelly glanced at the last few readings on the tape and leaned over and rolled the youth's head gently to one side. A stream of blood spilled down his neck from his ear.

She looked at Ben and shook her head.

The medtechs wheeled the table and its still form out into the red glare of the ambulance's warning lights.

The crew of Car 56 watched the table vanish into the other vehicle. Red sheets of rain splattered off the hull of the vehicles and the wet roadway.

"You can't win 'em all," Ben swore softly, "but why can't we win the ones with the kids in them?"

A moment later, the medtechs came racing back with a new surgery table for the Patrol car. They rolled it up the ramp and Kelly grabbed it and waved. With Clay's help, she shoved it into the deck clamps and the medtechs ran back for their own vehicle. Seconds later, the ambulance with the dying boy and the body of the dead girl, was hurtling back down the police lane towards Ash Fork.

Ben recovered the cable and winch panel in Beulah's bow and then headed into the cruiser to the men's quarters to clean up and change into dry uniform coveralls.

The wrecker had arrived and the shattered hulk of the sports car had been hauled up the face of the slope. The crews were installing warning lights and temporary barriers along the smashed railing.

Ben got Flagstaff on the radio. "Better keep the yellow closed until this storm moves and at least for the rest of the night," he suggested. "You might lose another one over the side in the dark. Stand by for registration check."

Clay had removed the registration tab from the wrecked car and was back in the cab. He handed the tab to Ben and then checked with Kelly to see if she was ready to roll. "Go ahead," the girl replied. "I'm just cleaning up back here. But give me a couple of seconds warning in case we have to go Code Three in the next few minutes. I've got some of my equipment unracked."

Beulah rumbled across the Colorado River causeway shortly before two in the morning and the control shifted back to Los Angeles. At six in the morning, Car 56 jockeyed into a parking slot in the Los Angeles Barracks motor pool and the completion of the ten-day patrol. The two troopers spent a half hour with the maintenance crew chief going over a number of minor discrepancies in Beulah's operation.

"You might as well give her a real going-over," Ben told the mechanic. "Don't know how long we're going to be tied up here in L.A. I know it's going to be at least six more days and it could run twice that long. She's due for blade rebalancing in another four hunderd hours so I'd just as soon get that done now and get new throat liners installed at the same time."

"While you're at it," Clay added, "we can use either a repolishing job on the cab bubble or a new bubble. That sandstorm scratched and pitted the canopy and we're getting halation and streaking at night."

The crew chief made notes and then began unlocking outside inspection ports for the start of the routine vehicle inspection. Ben and Clay collected their gear and headed for the dispatch desk. Kelly had already left the car to report to the medical section with her tapes and reports and would meet them later.

At the dispatch desk, Ben shoved the closed log across the counter to the corporal on duty. The dispatcher glanced at the car number on the log book and then punched Car 56 off the ready board. He turned and reached into a cubbyhole behind the desk and extracted a memo sheet.

"You and your crew are to report immediately to Captain Fisher," he told Ben. He shoved the memo across the counter. Ben nodded and motioned to Clay.

"Will you call over to medical section and inform Officer Lightfoot to meet us here?" Ben asked the corporal.

"She's already been notified," the man said, "and she's on the way over here. Go on into the old man's office and I'll send her in when she arrives."

Ben and Clay headed for Fisher's office.

"We've had so-called 'VIP's' on the docket before," Fisher said, "but never of the political and economic influence of the Shellwoods."

He paused and studied the faces of the three members of Car 56 sitting across the desk from him.

"Since you left here ten days ago," the captain continued, "we've felt the start of the most vicious attack on the Thruway Authority since it was first created. Old man Shellwood has unleashed every one of his hounds on us in an effort to save that kid of his from jail. And this is only the beginning. Before we get through the trial, not only the Authority, but the three of you are going to be subjected to the toughest fight you've ever been involved in.

"Just for a starter, Shellwood's attorneys are entering countersuit charging false arrest, brutality, usurpation of authority and cruelty in subjecting Junior to the perils of disaster in the pileup that you handled while you had him in custody."

Fisher got up from his desk and went to a window that looked out on the huge motor pool area of the barracks. Scores of the sleek and massive blue Thruway cruisers were parked on the line while service crews swarmed over them. He continued his monologue with his back to Beulah's crew.

"We've worked like dogs to build this agency up for the sake of the people," Fisher murmured, "and now one lousy individual is trying to tear it down for his own personal gain.

"When you leave here, you three are to report to the prosecutor's office. He wants to go over all of the arrest reports and the rest of the material that he'll be using when we go into court next Monday. I've gone over all of the tapes and your written reports and I'm satisfied that you acted not only with proper authority but with the degree of propriety that I expect of every Thruway crew. But that may not be enough. There's more at stake here than a simple case of drunk driving charges against an individual."

Fisher turned to face them.

"Nobody loves a cop," he said grimly. "I don't have to tell you that. Everybody wants one in a big hurry when their tails are in the wringer but for the rest of the time, we're just trying to persecute innocent people when we apply preventative measures before they kill themselves. There's been a lot of talk in Congress about the federal appropriations for Thruway Authority and about the abrogation of American Constitutional rights to the Authority. As usual, the people want to have their cake and eat it, too. They know they could never have had the road system that the Thruways have given them on either a state or national financial basis and that the only way it could be realized was through a continental sharing of costs between the three nations. Well, they've got the roads and now they want to pull out and stop sharing the cost of keeping themselves alive. And Shellwood's outfit is using every bit of anti-Thruway feeling possible against us."

The captain slammed his clenched fist against his desk. "That Shellwood would kill off half the population of this continent if he thought it would keep his kid out of jail."

Ben slumped in his chair, glumly surveying the mosaic pattern of the floor. "What's it take to stop him," he asked without looking up.

"Huh," Fisher snorted, "that's simple. We drop the charges against the kid and the old man grins and goes about his business. And he'll keep grinning until the kid goes out on the roads again and kills himself and probably some other people at the same time. Then the old man will scream for our scalps for not protecting his innocent child from the horrors of the Thruway. But the point is that if he wins this one, it can destroy much of what we've worked like dogs to create. Our biggest gun in the fight to keep people alive on the Thruways has been that the law is bigger than any one person or group of persons and that all violators are treated equally in the courts and on the roads. They know that their basic protection lies in the fact that major violators are barred from the Thruways for life through impartial justice by our courts. Let there be a break in that faith and the entire system is weakened.

"Well, enough of this. You three are now on detail to the prosecutor's office until the completion of this matter. Keep me posted on what's happening."

The trio saluted and left Fisher's office. At the prosecutor's office, Kelly and Clay were asked to wait in the anteroom while Ben was ushered into the inner office.

The Thruway prosecutor was in his middle fifties, slightly balding and beginning to run to paunch. He came around the desk as Ben entered. "I'm John Harvey, sergeant," he said with a smile, his hand extended. "Welcome to the siege of Troy."

He waved at a chair and Ben sat down. Harvey shoved a cigarette box across the desk and then reached for a thick file of papers and microtapes.

"I'm going to level with you, Martin," Harvey said, tapping the pile of evidence. "This is going to be a nasty one. I've set this interview up so that I can talk to each one of you individually and then check each of your stories against the other and then each and all against the reports and tapes. Now don't get me wrong. I haven't the least doubt in my mind that you all have acted in the best possible manner. But if there are any minor technical discrepancies, I want to know about them and be ready to counter them before that battery of defense lawyers has a chance to nail you to the cross."

"Now let's start at the beginning and tell me the entire story as it occurred." Harvey leaned back and lighted a cigarette and Ben began talking.

While Ben was relating the events of Kevin Shellwood's arrest and the subsequent events, Harvey made occasional notes. When Ben had finished Harvey leaned forward.

"Is that the entire story?"

Ben hesitated thoughtfully. "As far as the actual arrest and the details of the patrol, that's the story."

"What's that mean?" Harvey queried.

"There have been a couple of things that may have bearing on the case that have occurred since we first pulled into L.A. with Shellwood."

"Such as what?" Harvey asked with a raised eyebrow.

Ben related the visit to his room by Shellwood's attorney before the preliminary hearing.

" . . . And when I got through telling him off," Ben finished, "I threw him out into the hall."

Harvey leaned forward excitedly. "Was there anyone else present while he was making the proposition?"

"No," Ben replied. "Officer Ferguson arrived just as I tossed the guy out into the hall but I don't think he heard any of the conversation."

Harvey sat back disappointedly. "I really didn't expect anyone else to be there," he said. "Those people are too smart for that. You know, if we could prove any attempt by either old man Shellwood or his attorneys, we could bring them to trial, too. But, I suppose, that's too much to hope for."

The two men smoked in silence for a moment. "You said that there were a couple of things that might have bearing," Harvey said. "What's the other thing?"

"I got a telegram from Shellwood Electronics," Ben replied, "raising the ante and keeping the offer open."

Harvey snapped upright in his chair. "Where is the wire?"

"I don't have the actual wire," Ben explained. "It was relayed to me from Oklahoma City Control. The dispatcher forgot to deliver it before we pulled out and I had them open it and read it to me on the air."

"That might be the answer to a tired, old prosecutor's prayer," Harvey exclaimed. He grabbed his desk communicator. "Ruth," he said to his secretary, "get Oklahoma City Control headquarters right away and have them get hold of the original copy of a telegram addressed to Patrol Sergeant Ben Martin." Harvey paused and looked up at Ben. "What date was that sent to you?"

Ben told him.

"That was on the 15th, Ruth," Harvey continued. "Tell *them I want that* original, together with their log of the transmission to Car 56 concerning that telegram and their sealed tape recordings of the transmissions on the next jet for L.A. Tell 'em I want the entire package here no later than 1300 hours this afternoon."

Harvey sat back and smiled at Ben. "I think somebody goofed," he said gleefully. "I'll give you ten-to-one odds that that wire was never supposed to have been sent. What probably happened is that Shellwood's lawyers had a contract and binding papers drawn up and given to the personnel section and then were going to contact you in person but without witnesses after you got back here to Los Angeles. Probably some over-zealous apple-polisher in the personnel section, like the personnel manager, has taken it upon himself to get hold of you in hopes of currying the old man's favor. And if this is the case, and I'm almost positive it is, we have a chance.

"Now, how was that wire worded?"

"As nearly as I can remember," Ben said, "it said in effect that the original offer is still open for forty-eight hours and that they'd make me director of transportation with an unlimited salary. And I was to contact the personnel manager when I got here."

"Fine," Harvey said, "just great. Get on the horn and call the guy right now and make an appointment. You are about to become the new Director of Transportation for Shellwood Electronics."

Ben stared at the chubby lawyer. "Are you out of your mind, sir?"

Harvey grinned. "I've never been more serious in my life. You're going to go down there and dicker with these people before their lawyers have a chance to realize what's happening. And you're not only going to dicker over your job—you're going to get plush offers for the other two members of your crew. After all, even with you out of the picture, we could still have a pretty good case against Shellwood with them on the stand. You've got to make the company see that and make them come up with a good offer. Then all three of you are going to take the jobs."

"But that means resigning from the Patrol," Ben protested.

"It sure does," Harvey said. "I'll see that the papers for your resignation and discharges are drawn up right away. Now let's get the rest of that crew of yours in here. We've got some planning to do and not much time to do it."

He barked into his intercom. "Ruth, send in the other two officers and get in here with your vocawriter."

When the crew of Car 56 was assembled in Harvey's office and when his secretary had adjusted her vocawriter mask, the prosecutor began outlining his ideas.

"Now if this works," he said, "by early afternoon you three should be discharged from the Patrol and well on your way to becoming employees of Shellwood Electronics."

"Now wait a minute," Ben growled, "I have no . . . "

"Shut up, sergeant," Harvey snapped, "and don't interrupt me until I get through. Then you can talk.

"As I was saying. You three should all get pretty good offers. But they may be predicated on your full discharges from the Patrol and they'll want to see physical proof of such discharges. We'll have them for the company to see.

"Ruthie, see that the paper work is done within an hour on the discharges of Patrol Sergeant Benjamin Martin, Patrolman Clay Ferguson and Medical Officer Kelly Lightfoot. Also, draft up simple letters of resignation for their signatures. You know the word, 'for personal reasons, et cetera.'

"When you get those done, have one of the other girls working on three arrest warrants. The usual forms. The charges will be identical for all three. Coercion and conspiracy to coerce and bribe and otherwise intimidate duly authorized officers of the Thruway Authority. The warrants and the charges are to be drawn up for the arrest of Quentin Shellwood, Paul Quinn and Theodore Hackmore. Have them ready for my signature before noon and I'll have the tongues ripped out of the heads of anyone in this office that lets one peep of this out until the warrants are served."

Harvey paused and looked at the trio of patrol officers sitting with dazed smiles on their faces. "Starting to get the picture now?" he asked.

Ben nodded silently.

"That'll do for now, Ruthie. When you get back to your desk, get me the commissioner on the horn." The secretary left the room.

"Now here's a list of a few gadgets I want you people to draw from the investigation section," Harvey said, jotting information on a pad. "You'll need it when you talk about your new jobs in a little while."

"Who may I say is calling please?" the receptionist asked.

"Tell Mr. Hughes that Ben Martin wants to talk with him. Tell him he sent me a wire in Oklahoma City a couple of days ago, just in case my name doesn't ring a bell with him."

The visiphone screen went blank and Ben waited. When it lighted again the face of a man in his middle forties, sporting a small mustache, stared out at Ben.

"Ah, Mr. Martin," Hughes said, "nice of you to call. And just where are you making this call from, if you don't mind my curiosity?"

"I'm downtown at a pay booth," Ben replied, stepping back so that the busy street intersection could be seen over the visiphone.

"Excellent, Mr. Martin," Hughes beamed. "I just knew you would be a man of discretion and understanding. Now, just what is it you wished to speak about?"

"Is your offer still open," Ben asked. "I'd like to come in and talk to you about it."

"It most surely is," Hughes replied, "and I'd be delighted to talk to you about it. I assume then that you are interested?"

"I'm interested," Ben said guilelessly, "but before I commit myself there are a couple of other details that

I'd have to work out with you before we could come to any terms."

Hughes eyebrows raised. "Matters of money?"

"Not exactly," Ben said. "I have a couple of friends who I feel would be invaluable not only to me as members of the organization but also invaluable to you as well. They are the other two members of my cruiser who were with me on the night we came down from San Francisco and have almost as much information about the incidents of that night as I do. I think you can see the wisdom of my point."

Hughes nodded knowingly. "I see the point quite well and as a matter of real coincidence, we had already made plans to assimilate these good people into our organization at the same time we procured your services. I'm way ahead of you Mr. Martin. Now there is just one little detail I would like to arrange before we get together for our talk."

"What's that?"

"You realize, of course," Hughes said smoothly, "that we would be somewhat embarrassed by signing an officer of the Thruway to contract while that officer was still in the service. Therefore, I must insist that you be discharged and have completely severed your connections with the Authority before coming to final terms."

Ben smiled. "This time, we're way ahead of you. Our discharges are now being processed and will be ready this afternoon."

"My, but you certainly must have been sure of us," Hughes said.

"I was," Ben replied laconically. "You can't do without us and if you back out now, even though we might be out on our ears with the Patrol, we could still be brought to the stand as witnesses."

Hughes smiled and shrugged. "Quite so, Mr. Martin. I can see that you're going to be a big asset to us. You already think our way. How soon can we get together?"

"I'll be at your office in an hour with my crew," Ben replied. "If we can come to terms, we can wind it up this afternoon."

Ben broke off the connection and walked out of the booth. The hot summer sun filtered down through the maze of overhead state and city expressways and the highest level of the Continental Thruway running abreast with the twentieth level of the office buildings piercing the sky. He threaded his way through the pedestrians to an autocab parked at the curb. Kelly and Clay, both in civilian dress as was Ben, waited for him.

"We go up to Shellwood in an hour," Ben told them. "Let's get a bite of lunch and go over the operation once more before we go into the lion's den."

They left the cab and strolled along the busy thoroughfare to a nearby restaurant.

"That transceiver working O.K.?" Clay asked Kelly.

"It was a few minutes ago," she replied. "You still there, Mr. Harvey?"

Hidden under the copper-red waves of her hair, a tiny earpiece was stuck with collodiplast to her left mastoid bone. "Just as though I were walking with you, Miss Lightfoot," Harvey's voice sounded in her ear. "We are monitoring all three of you loud and clear. And we've just had word that Shellwood Electronics is checking on your discharges and have been told they are being processed. The fish has taken the bait."

"He's there," Kelly told Clay.

An hour later they were seated in Hughes' office in the massive Shellwood Electronics headquarters building on the outskirts of Santa Monica.

"You understand," Hughes said, "that the contracts will become effective immediately upon proof of your separation from the Authority. Now here are the contracts we have drawn up for your approval." He shoved three documents across the desk.

"You will note," he continued, "that the contracts specify that you will accept employment at any place the company desires to assign you and upon the immediate notice of such assignment. Of course, any financial inconvenience brought about by such a move would be borne by the company."

"What's that mean?" Clay asked.

"Quite simply," Hughes said, "that we will have immediate assignments for both you and Mr. Martin at our operational offices in Paris. Miss Lightfoot will join our medical staff in London."

"All three of us out of the country before any trial date, eh," Ben said with a knowing smile.

Hughes returned the smile. "In the best interests of our organization, you understand."

"Get those contracts on film," Harvey's voice sounded in Kelly's ear.

Kelly shoved her contract over to Ben and then took Clay's and pushed it to the senior patrolman.

"You're the brains of this outfit," she said brightly. "Does the picture look all right to you, Ben?"

Ben smiled at her and laid the three contracts side by side on Hughes' desk. "Let's see how they compare," he said. He pulled a pen from his pocket and ostensibly went through the contracts rapidly, line by line. When he had finished, the contracts were on microfilm in the pen. "They look fine to me and the money sounds quite acceptable."

"Do we sign now?" Clay asked.

"There's just one more slight detail," Hughes said. "I have another document which needs your signature. I think that after you have read it, you'll understand the need for it." He pushed a single printed sheet across to Ben.

Ben read the document aloud.

"We the undersigned persons do agree not to testify in any fashion whatsoever against any member of this company or any subsidiary corporation in consideration of contractual employment with this corporation or any subsidiary thereof."

Typed in below the text were their three names and places for their signatures.

"Hell," Ben exploded, "if we sign this, then we become parties to a conspiracy."

"You have a quick mind, Mr. Martin," Hughes said. "I fully realize that this paper wouldn't save anyone from prosecution. But it will assure us that if any member of our organization should be prosecuted on the testimony of any of you, all three of you will then be in the same boat. Just let's call it a little insurance."

"Do your company attorneys know about this?" Ben asked.

"It was drawn up by them," Hughes said haughtily. "But I see no need to drag them into this discussion since we are doing so nicely.

"Now if you'll just sign both the contracts and this paper," Hughes said, leaning across the desk and pointing to the proper places. "You'll get copies of the contracts after we have certified your discharge papers from the Authority. There is only one copy of this other little paper. We'll hang on to that for safekeeping."

Ben held the camera-pen over the self-incriminating document.

"Stand by to assist boarders," Harvey's voice sounded in Kelly's ear.

The door to the outer office burst open and three men entered. One of them went immediately to the desk and seized the papers.

"What's the meaning of this," Hughes spluttered. "You have no right in here. Get out and put those papers down."

One of the intruders flipped open a leather case and held it up.

"Los Angeles Metropolitan Police," the man said. "You are under arrest, Mr. Hughes." He took the personnel manager by the arm.

Sixty floors above, in the same building, two other plainclothesmen shoved their way past the receptionist in Quentin Shellwood's private suite of offices. A uniformed Shellwood security guard rushed up to block their path.

"You can't go in there," he ordered.

"Want to bet," one of the officers said, pushing the man aside and flashing his identification. The uniformed guard continued to block the way. "I don't care if you are L.A.P.D.," he said, "you just don't barge in on Mr. Shellwood."

The other officer displayed a badge and card case. "FBI," he said tersely, "now get out of the way." The guard paled and backed off. The two agents entered the inner sanctum.

Quentin Shellwood glared up at them from behind his desk.

"Who let you in?" he bellowed. "Get out."

The federal agent displayed his credentials. "Will you please come with us, Mr. Shellwood? We have a warrant for your arrest."

Shellwood's face purpled. "Just who do you think you are," he roared, "ordering me around? And what are you arresting me for?"

The federal officer pulled out a warrant. "I have a joint Federal and Thruway Authority warrant charging you with conspiracy to coerce and with bribery. Now will you please come with us?"

"I will not," Shellwood cried. "I'll see you two in hell before I leave here on some phony trumped-up charge." He reached for the visiphone. The metropolitan officer reached out and clamped a hand on his wrist.

"Mr. Shellwood," he said softly, "you can come with us in good order, or you can come along in handcuffs. It doesn't make a bit of difference to us. But you are coming. And you'll make no phone calls until you are at headquarters at which time you will be allowed to consult with counsel. Now what's it going to be?"

The executive glared at the pair for a second and then got up from his desk. "Would it be all right with you gentlemen," he asked sarcastically, "if I call my wife and tell her that I may be late for dinner?"

"I'm sorry, sir," the federal agent said, taking Shellwood by the elbow and leading him to the door. "Perhaps you can contact your wife later."

Shellwood shook his arm from the agent's grasp. "Get your hands off me," he snarled. "I can walk by myself."

Flanked by the two officers, the head of the nation's largest corporation walked out of his office before the wondering and stunned gazes of his staff.

A half hour later at the opposite side of the city, a similar scene was being enacted in the offices of the law firm of Quinn, Reynolds, Chase and Hackmore. Accompanying the two metropolitan and federal agents were attorneys from the offices of the Thruway Authority and the United States Attorney for the State of California.

While the senior and junior partners of the firm were being taken into custody, other agents, armed with warrants, were moving down the line of vocawriters in the outer office, stopping at each machine to speak thirty-five words into each device. As each vocawriter spewed out its printed text, the agents checked it against a photo copy they carried. Halfway down the bank of machines one of the agents called out. "Here it is."

The other men crowded around him and compared the copy in his hand against the copy on the machine. It read: "We the undersigned persons do agree not to testify in any fashion whatsoever against any member of this company or any subsidiary corporation in consideration of contractual employment with this corporation or any subsidiary thereof." On both the photo copy and the text from the vocawriter, the tail of the letter "y" wherever it appeared, was partially snapped off.

The trial of Kevin Shellwood on the original charges of driving while drunk, attempted bribery, et cetera, opened the following Monday. It lasted less than a day.

In their individually sealed rooms, the twelve jurors watched the courtroom proceedings through special wide-angle video monitors and viewed and listened to voice and video evidence tapes on their individual screens. Neither the prosecution nor defense could see the jury or gauge the effect their legal maneuverings were having on any one juror. Each of the jurors had been selected from the venire list, sight unseen and had been challenged and questioned in the same manner.

Now, the prosecution was in its concluding statements. Dumpy John Harvey faced the judge and unblinking video eyes of the jury box.

". . . And man has progressed from the primitive law of the jungle. I have no quarrel with Darwin's theory of the survival of the fittest. But there is also no question but that an entire ethnic and cultural group can survive as the fittest rather than any single individual whose claws and morals might be more deadly than those of his neighbor.

"Our laws are designed for the protection of the masses of humanity and for the preservation of our progress. There can be no doubt in your minds about the evidence presented in this case. We have shown beyond a shadow of doubt that Kevin Shellwood was intoxicated at the time of his arrest. We have given you graphic testimony of the danger to untold lives that he posed in his unwarranted and liquor-laden driving of a three-ton projectile down a Thruway with the velocity of a medium-powered bullet. You have seen pictures and heard his actual voice as he attempted to bribe his way out of his crime. Yet the case of Kevin Shellwood can not stand of itself. In a few days, his father and his attorneys, together with other employees of the rich and powerful industrial empire of Shellwood Electronics, will come before another court and another jury to face additional charges of coercion and attempted bribery. Their alleged crimes are part of Kevin Shellwood's story for both father and son have attempted to set themselves apart from human society; have used money, influence and power to corrupt society for their own ends. They have said in effect 'we recognize no law but that of the clan.'

"Members of the jury, Kevin Shellwood is on trial here today but at the same time, so are you, as representatives of the people. If Kevin Shellwood is freed of the charges against him, society has signed its own death warrant. The magnificent transportation system that a free people of an entire continent have created for their own benefit and safety will become an open invitation to murder by those with enough money to buy their way out of their crimes. You can have no choice but to find Kevin Shellwood guilty as charged. Thank you."

Harvey bowed to the judge and went back to his seat.

At the bench, Thruway Authority Justice James Bell addressed himself to the dozen faces watching him intently on a dozen small monitor screens concealed in the rim of his desk. The faces of the jurors were hidden from all but the judge. He gave his charge to the jury. When he had finished, covers slid down over the video eyes of each juror's room. The jurors could discuss the case over a closed circuit that was unmonitored by any other source.

Across the big courtroom, Kevin Shellwood slumped in his chair at the defense table and eyed the trio of Patrol officers from Car 56 at the prosecution tables. The younger Shellwood was flanked by three attorneys but not Quinn and Hackmore. They sat in the spectators section together with the senior Shellwood, freed under fifty thousand dollars bonds pending their respective trials.

Kelly Lightfoot leaned towards Harvey. "What do you think Kevin will get if they find him guilty?"

Harvey shrugged. "I dunno. That's up to the judge. My guess is that he'll throw the book at him on both sentence and fine and then possibly withhold some of the sentence. But you never know how these things will turn out."

Kelly looked across the room at the obviously nervous younger Shellwood.

"I feel so sorry for him," she murmured.

"So do I," Ben said, "but not for the same reasons. He might have been a good kid at one time and he still may turn out all right after this is over. But I can feel a lot sorrier for the people that he might have killed. And when this is over, at least he'll be alive and won't kill himself or anyone else on a highway."

The crew and Harvey got up and went out into the corridor for a smoke. They had just taken a couple of puffs when a muted buzzer sounded at the door to the courtroom. "The jury's ready," Harvey said, snubbing out the cigarette and hurrying back into the courtroom.

Justice Bell was re-entering the room and ascending the bench as the Patrol crew walked back into the courtroom. The judge seated himself and then pressed a button on his bench. The twelve panels slid up from the jury videos. On the bench, the judge's monitors showed the faces of the jurors.

"Have you reached a verdict?" Justice Bell asked.

From a speaker over the bench, the voice of one of the jurors sounded. "We have."

Bell glanced up at the defense table. "The defendant will rise and face the bench." Kevin pushed his chair back and stood up.

"Members of the jury," the judge said, "how do you find?"

"We find the defendant, Kevin Shellwood, guilty as charged on all counts."

Across the room the youth slumped and pressed his palms against the edge of the table. His head was bowed. In the spectator section, his father half arose from his seat but was pulled back down by the two lawyers.

Justice Bell addressed the jury. "Is this the verdict of each and all of you individually and collectively?" he asked. "I now poll you individually. Juror Number One, is this your verdict?"

From the speaker above the first video lens came the words, "It is." The justice continued through the twelve. When all had agreed, the judge paused.

"I thank the jury for its verdict and now dismiss it." The covers slid down over the video lens and the monitors on the bench went blank.

"The defendant will approach the bench."

Kevin moved out from behind the defense table, two of his attorneys following him. He halted before the bench.

"Kevin Shellwood," Justice Bell said, "you have been found guilty of all charges against you. Do you have anything to say before the court passes judgment?"

Shellwood shook his head.

"Very well," Bell said. "I hearby sentence you to serve a term in the Thruway Correctional Institution at St. Louis, Missouri not to exceed five years on each count, the sentences to run concurrently. I further fine you the sum of twenty-five thousand dollars. However, upon the recommendation of the prosecuting attorney and the recommendation of the arresting officer for your part in a disastrous situation on the Thruway after your arrest, I am suspending two years of your correctional term. And I further direct that the final year of your term, after time for good behavior has been deducted, be spent either on trustee status or under guard depending upon your honor, as an attendant crew member of a Thruway ambulance team. Perhaps then you can witness the kind of tragedy that you came so close to creating.

"I further warn you that under the laws of the Thruway Authority, you are automatically barred for life from the operation of any kind of surface ground vehicle and that failure to comply with this law will bring not only reinstatement of your full sentence but an additional sentence of ten years in correction.

"I should like to add this comment. I personally feel that you are the product of your environment and your family. It is unfortunate that you failed to learn at a much earlier age that laws are made for all people and that there is no such thing as a privileged class. I sincerely hope that in your future dealings with your fellow men following your release, that you will recognize this fact."

Justice Bell raised his eyes and looked over the younger Shellwood's head to the spectator section where Kevin's father sat.

"It may come as a shock to some people to realize that in this complex society in which we live and this ever-growing technology that both serves and threatens mankind, there are still people to whom the service of humanity is more important than rising above that humanity.

"This trial is ended."

Justice Bell rose from his bench and walked from the courtroom. Two Thruway officers moved up and led Kevin Shellwood away.

The spectators filed out of the courtroom and the crew of Car 56 followed. As they moved past the row of seats where the elder Shellwood still sat, Ben glanced over at the older man. Quentin Shellwood caught the look and turned his face defiantly to the officer. Pure hatred glowed in the older man's eyes. Ben paused and looked steadily at Kevin's father for a moment and then sighed and hurried after his crew.

He caught up with them in the corridor. "Come on," he said, taking Clay and Kelly by the arm. "We've still got time for a leisurely lunch before we head back for the barracks. We'll probably be rolling by nightfall. And I gather from what the old man says, we draw the Miami run this trip."

Clay looked up and stopped. "No kidding, Ben. You really think we'll draw Miami?"

Ben nodded.

Clay fished in his tunic pocket and pulled out the little address book.

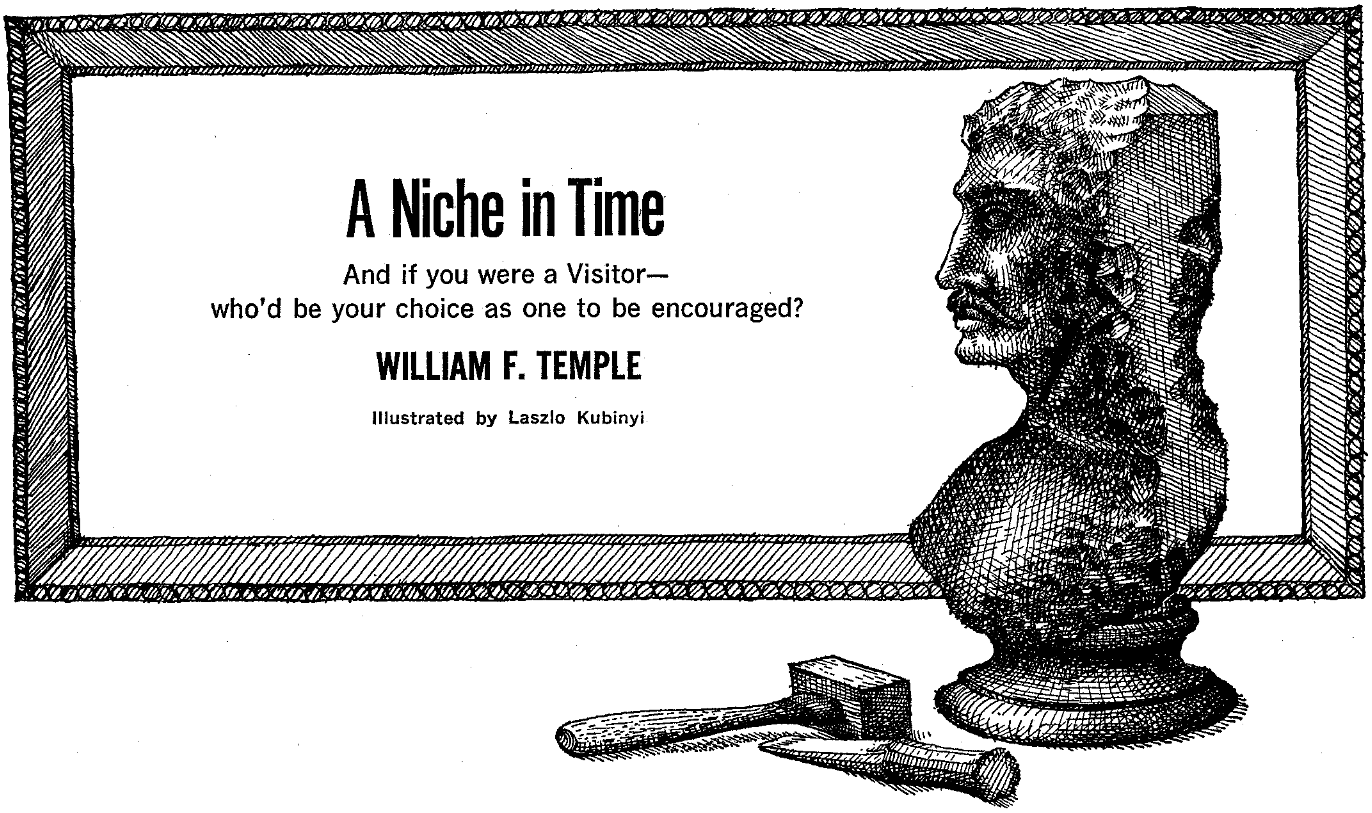
"What a break," he murmured, thumbing through the pages, "I didn't think I'd get to see her again this year. Now what was her last name. . . ." ■

PALMISTRY; 1964!

RALPH A. HALL, M.D.

The scientific study of finger and palm prints is called dermatoglyphics. The study is only now beginning to play a sophisticated role in the field of human genetics. In a report at the Eleventh International Congress of Genetics by Dr. Hoefnagel of Dartmouth Medical School, Dr. Mowalwala of the University of Manitoba, and Dr. Penrose of the University College, London, it was revealed that a distorted finger and palm ridge pattern may exist in mongolism; trisomy of chromosomes 13, 17, and 18; undifferentiated mental retardation associated with irregularities in several different chromosomes; and Turner's and Klinefelter's syndromes. The two named syndromes are associated with ovarian agenisis and aspermatogenisis respectively. The ridge patterns become apparent during the twelfth and sixteenth week of gestation. The ridges, unlike the grooves in palmistry, do not foretell the future, but possibly they may tell a lot about a person's basic make-up. Only in this one respect a palmist might scientifically look at a palm and say: "I can see this person is going to act like an idiot!"

From the Medical World News, September 27, 1963.



A Niche in Time

And if you were a Visitor—
who'd be your choice as one to be encouraged?

WILLIAM F. TEMPLE

Illustrated by Laszlo Kubinyi

It had to be a painter this time. My kind of painter.

I've catholic taste, but a natural bias. Music, literature, poetry, the theater, sculpture, architecture: all stairways for my spirit. All tracks up the slopes of Parnassus.

Yet to me the crest meant just one thing: a certain masterly arrangement of colors and of light and shade, bringing blazing exaltation.

It had to be van Gogh.

Concerning others there was usually doubt about the right Moment to choose. Vincent's Moment for me, personally, was the painting of his masterpiece, "The Yellow House." For my employer, the University, Department of History, sub-Department A.E. (Active Encouragement), the Moment was in the Borinage, during van Gogh's period of greatest early discouragement. The Church Council had declared he was a most unsatisfactory preacher, and flung him out.

He didn't know which way to turn. So I visited him.

Shortly afterwards, he wrote to his brother, Theo: "I decided to take up my pencil and start drawing again, and from that moment everything looked different."

He was twenty-seven then.

I had been the man of that "moment," which it's my job to be: I am a Visitor.

It's a responsible job, and the strain of saying the right thing at the right time can be wearing on the nerves. So the University, which is sometimes understanding—but often not—allows me the odd trip now and then purely for relaxation. A little holiday.

This holiday I wanted to see a painter. My kind of painter. I chose to revisit Vincent eight years after the Borinage—eight years of *his* time, of course. On a day when the paint on the canvas of "The Yellow House" was still wet. . .

In my excitement I miscalculated, and instead of the tree-sheltered park set the chronocab plumb in the center of the lawn in Place Lamartine. But no one was around to witness me stepping out of nothingness. I was in costume, as always. This time masquerading as a French agricultural laborer, with walnut juice brown-staining my face and arms.

One must never excite the attention of the populace.

There it stood, on the corner. The yellow house itself, with its green door. The sun drenched it, but the yellow was hard, lacking the honeyed warmth from Vincent's brush. The sky above it was pure cobalt, lacking the magic ingredient of black Vincent had worked into *his* sky. It takes a master painter to gild Nature.

Beyond, on the right, the glamorous *Café de Nuit*—dusty, crumbling, prosaic in plain daylight. Also, the two railroad bridges, and just crossing the nearer—a timely gift from Time!—a slow, slug-black, smoky train.

Wide open to every precious nuance of awareness, I lounged across the brown grass.

This time it wasn't necessary to explain that I was a Visitor. It's never easy to do, and it was nice to be able to relax. Vincent van Gogh still had two more years—the terrible years—to live, and there was nothing I could do about that. His disease was already deep-rooted in his brain.

My French was far better than his, and he accepted me as a Frenchman. An odd type, admittedly: a laborer who knew something about the technique of painting. But Vincent was already dwelling in a fantasy world, and I became merely part of it to him.

On my first visit it had been more difficult. He had been let down badly. He was suspicious: thought I was an agent of the Evangelist Committee. I was a pretty good linguist, even then, but Dutch wasn't my strong suit. He'd been teaching—and preaching—in England, so we got by in English that time.

And that time I took him back to England—in the chronocab.

London in midwinter, 1948. A dark gray day by the dark gray Thames. There was an endless drizzle from a sky of mud. We arrived behind a telephone booth—its red was the only visible splash of color—on a side street.

I led him around the corner, and there on the sidewalk, patient in the rain, was a line of more than a thousand people. Slowly, they were shuffling into the Tate Gallery. And as the big building swallowed the head of the line, so others joined the tail, keeping the line at a constant length.

"That," I told him, "has been going on all day. It went on all yesterday. So it will go on, day after day. A thousand people an hour, every hour. All records for attendance at an art exhibition have already been smashed. These people, weary after a long war, are starved of sunshine and color. They flock here to feast their souls on the work of one great artist."

"Rembrandt?" he guessed, innocently, watching the traffic on the street with a wondering but wary eye. It was thin today, but I had warned him of it.

"No. You—Vincent van Gogh."

He was stunned, and had no words. Those wild pale-blue eyes rolled more wildly. I feared he would have one of his fits, but his shaking was only excitement at this evidence of his unbelievable success.

We stood in line, so that presently he could see for himself the blazing sunflowers and orchards of the future in his style of the future. . .

And now, in that future of his, in Arles, on my second visit, I stood with him again, looking at some of those very same paintings: unhung, unwanted, unbought.

The thick paint of "The Yellow House" was damp as toothpaste on the canvas: he'd just brought it in from the square. I could have left my thumb print on it for posterity—theoretically.

I savored this historical Moment.

I pictured this little house when the mistral howled around it, setting the windows rattling, the doors banging, and Vincent's super-sensitive nerves on edge.

I looked at the mess of dropped paint on the floor and the splashes on the walls. Soon Vincent would clean that up and whitewash the walls. For his hero, Gauguin, was coming to stay.

And one day, during Gauguin's stay, the red-tiled floor would become redder yet, with Vincent's blood, and all the splashes on the walls would be crimson.

I glanced at his right ear, and felt again the old awe of Nemesis. Effectively, the chronocab was like a fly buzzing across the path of a runaway truck.

Maybe the universe is mad. If so, the most you can do is try to give people courage to face it.

If ever a man needed encouragement, Vincent did. Pick a moment at random in his life and you could reasonably call it the Moment. Here and now in Arles, for instance. He still hadn't sold a single painting. He was to sell only one in his life, and that for under four hundred francs.

Would it help if I told him that in Paris, in 1957, just one of his paintings would be sold for the equivalent of two hundred fifty thousand of those same francs? And at that period his total output was to be valued at thirty million francs? He needed money and food *now.* More likely it would embitter him to learn that art dealers, of the same ignorant breed that had spurned him all his life, would make fortunes from him when he was dead.

So I didn't tell him.

In any case, this time I had no authority to back such a statement. The first time, I revealed my identity and proved it by demonstration. Then, my mission completed, electronically erased the traces of it, which was standard procedure. This time I was just Francois, an appreciative peasant, who wanted to learn about technique from an obvious master.

As I hoped, lonely Vincent, deprived of communication on the subject, except in letters to Theo, was eager to expound.

Finally, he settled on the bed, smoking and talking nonstop. While I sat on the rush-seated chair he was to make so famous, drinking his words in. My hero, the genius who it had been my privilege to help, explaining himself and his work to me personally, on a warm evening in Arles, far away in time and space. . .

It was unforgettable. Nevertheless, I dutifully transcribed it from the tape directly I returned. It was practically a two-hour monologue.

Would you like to know what Vincent van Gogh said? You can. Just read on.

My mind is purely that of an artist. It feels its way through a kind of colored fog. It reasons poorly, sees nothing sharp and clear in black and white. Mathematics has always baffled it. It can't grasp scientific technicalities. It merely apprehends form, tone, shades. . .

How was such a vague person as myself appointed a Visitor? Well, of course, I'm restricted to the Arts, just as my colleague, Blum, is confined to the Sciences. Sometimes I envy him his keen, precise mind. His task is to encourage the scientific geniuses at times when superstition, incredulity, or prejudice are stifling their creativity.

At least, he can offer a logical explanation of how past, present, and future are not merely interdependent but an immutable whole. And how an as yet unborn man can put his oar into some current human situation and add his pennyweight of influence to the scale-pan when a despairing creator is wavering between renewing the struggle or giving it up altogether.

When my particular nurslings of immortality ask me to explain the apparent time paradox, I begin to stammer. I fall back on insisting: "Well, it *is* so. For here I am. For further proof, I'll take you through time to my world, which is your world also: for you have conquered it."

Once, of course, they've tasted future—and often posthumous—fame, they never revive the argument. It might spoil the dream. When they've seen their paintings or sculptures in the Louvre, heard audiences cheering their operas or plays, handled many editions of their books in libraries, they're reborn.

The surly Beethoven, for instance, bitter through neglect, anxious about his growing deafness. Following that visit to Carnegie Hall he was as benign and joyous as his own Pastoral Symphony. It was the joy of faith vindicated.

Another paradox. Man is never without faith. He always believes. If a man says he has lost his faith, he yet has faith—in his belief that he has lost his faith. All the same, this seeming loss of faith can cause spiritual stasis. It's a whirlpool trap for a man's soul, which could circle pointlessly until he dies.

I explained to Ludwig von Beethoven that it was a Visitor's job to throw a line to such trapped souls.

He said, typically: "I am not the only one. I know of friends—"

"I cannot help your friends," I said. "Even if I tried to, I couldn't give them what fate has denied them. They have talent, not genius. Experience has shown that genius responds, talent does not. I can do nothing for them."

This led to a discussion on the nature of genius.

Beethoven's view was. . .

You can learn Beethoven's view on genius. And it will cost you nothing. Read on.

Analyze the most magical lines in poetry and you'll find they're evocative of the inexorable passage of Time.

But at my back I always hear
Time's winged chariot hurrying near.

Or:

Brightness falls from the air,
Queens have died young and fair,
Dust hath closed Helen's eye.

Or:

Nymphs and shepherds, dance no more. (A line which always moved Housman to tears.)

Shakespeare, of course, was the most Time-conscious of them all. He refers variously to Time as: "The clock-setter, that bald sexton . . . That old common arbitrator . . . A whirligig . . . A fashionable host . . . The king of men . . . Eater of youth . . . A great-sized monster of ingratitudes . . . Envious and calumniating Time."

And bids us: *See the minutes, how they run.*

And asks:

What strong hand can hold his swift foot back?
Or who his spoil of beauty can forbid?

And:

But wherefore do not you a mightier way
Make war upon this bloody tyrant, Time?

And declares:

Time, that takes survey of all the world,
Must have a stop.

His Sonnets are one long defiance of "Devouring Time." Constantly he repeats that, although Time will devour him, his lines will defeat Time.

Not marble nor the gilded monuments
Of princes shall outlive this powerful rhyme.

Which led to a mystery. After his retirement to Stratford he made no attempt to publish any of his plays. After his death, they would have been lost forever had not a couple of his friends collated some old prompt copies.

Was Shakespeare finally resigned to the inevitable victory of Time? Or was he just thumbing his nose at it?

I wanted to visit him in his retirement and solve this mystery. Some day I shall.

I must hear that beautiful, gentle voice again, speaking his lines with that fascinating Warwickshire accent he never lost. Men have wondered that, reputedly, in his manuscripts, "he never blotted a line." Of course not. He was an actor. It was his practice to speak his lines aloud many times until they *sounded* right. Then it was merely a clerical job to write them down. So naturally, as Heminge and Condell remarked: "His mind and hand went together."

I would have thought that his Moment for A.E. treatment was fairly late in life. Say, when in bitter despair at human ingratitude, he wrote the searing "Timon of Athens." But the departmental heads held that it lay somewhere in the Sonnet period, when he was in distress over his capricious rejection by the Dark Lady.

Maybe they were right. Anyhow, I visited him officially then.

The mysterious Dark Lady was certainly a *femme fatale*. There was poor Fortesque who, because of her, jumped from Old London Bridge . . .

She was . . .

Perhaps you know who she was. Again, perhaps, like those who strove for four centuries to uncover her identity, *you are still in the dark. You need be no longer. On the last page of this brochure you will find the key enabling you to unlock not only her mystery, but also many other mysteries of history.*

It was the night of March 3, 1875, the premiere of "Carmen" at the Opéra Comique in Paris.

The audience was ice-cold. It didn't understand the opera, so it was bored. The curtain came down to a snakepit chorus of hissing.

There was a well-known report, repeated by Bruneau, that Bizet walked the streets of Paris till dawn next day, hysterical with shame and despair. Later, Halévy testified that such was not the case. That after the show Bizet returned with him to their lodgings. That was so. I know. I walked behind them.

In some ways, this was the strangest of all my missions. Doomed to failure, yet it was written that I had to try.

The whole point of life is that we all have to try.

What I shall never quite understand is how encouragement given *after* a work is created can assist its creation. Blum tells me I must cease to think of time one-dimensionally, as a continuous line. I should picture it three-dimensionally. Say, as a cube.

A man's conscious mind moves from point to point over the surfaces of the cube. But his subconscious mind moves below those surfaces, darting around like a firefly within the cube. It can touch points of time anywhere on the cube long before conscious attention does.

Not that this is any new discovery. In the late Nineteenth and early Twentieth centuries experimenters confirmed the phenomenon of pre-cognition clearly enough.

Anyhow, the fact remains that the subconscious is aware of the Moment of Active Encouragement, and it's immaterial whether that Moment lies in the conscious future or past. For it is from the subconscious that all creation proceeds.

Bizet was alone in his room when I called in the small hours. He was still fully dressed, sitting at a table with a bottle of champagne and a half-full glass before him. He'd drunk only a little and was quite sober.

His face was impassive—and haunts me still. He had just received a mortal blow, but his self-control was almost superhuman. I respect him as a man perhaps more than any other man I've met, past or present. I've painted his portrait from memory. It depicts merely a fair-haired, fair-bearded man who looks thoughtful and—nice. (That unsatisfactory, and yet the only satisfactory, word.)

I've failed to capture, in paint, the essence of Georges Bizet. I shall try again.

I introduced myself and explained my presence. He seemed to believe me without proof, almost as though he were expecting me.

I told him: "In 1880 Tchaikovsky will publicly predict that within a decade 'Carmen' will become the most popular opera in the world. I'm glad to assure you that he will be perfectly right."

He smiled and poured me a glass of champagne. "Let's drink to Tchaikovsky, then."

"No," I said, raising my glass, "to Bizet."

"Thank you. You are the only man to toast me tonight. At this moment, all the critics are busily ripping 'Carmen' to shreds with their pen-nibs."

"Critics! On the rare occasions when their verdicts are unanimous, their reasons for giving them are totally different. Ignore them. You didn't write 'Carmen' for them. You wrote it for the people."

He sipped at his glass.

"That is true. And the people have rejected it."

"Come," I said, rising, "we'll go to the opera. I'll take you into 1905, and the night of the thousandth performance of 'Carmen.' "

He remained seated. "No, Monsieur Everard. The next generation is not my concern. I shall not live to know those people. I wrote for *this* generation, my fellow human beings. I have failed them."

"Nonsense! *They* have failed you."

"We've both failed—to communicate. And now something has broken in here."

He tapped his chest.

In three months—at only thirty-seven—he was dead. Of heart disease, the doctor said—though Bizet had shown no symptom of it before. Bizet's friends said yes, it was heart trouble: a broken heart.

It is true that when a man's spiritual mainspring breaks, it's beyond repair. The best that one can do is face the situation with calmness and courage. Bizet did just that. I shall always envy him his maturity.

There were other composers, too, of course, who died even younger, neglected "failures." The poverty-stricken Mozart, for one: he was buried in a pauper's grave. And the equally poor Schubert, for another, deeply frustrated in his love life also. Jon Everard met them both. His descriptions of those meetings will move you profoundly.

Vincent van Gogh and I are totally dissimilar in style, although I owe so much to him. If there is a distinct Everard style, then I have achieved it in my "Calvary." The version on my studio wall is actually my third attempt: I destroyed the others.

Strange how people who have admired it all assumed it to have come solely from my imagination. In fact, all three were painted in the neighborhood of Golgotha, and depicted the actual scene at the actual time.

Three crosses on a distant hill against a stormy sky . . .

Why didn't I approach nearer? I tried to, but something barred me each time. Possibly my own awe. Possibly some influence I don't understand.

Earlier, with the innocent daring of youth, I sometimes wondered whether I could possibly be intended to serve as a humble instrument in the Second Coming . . .

Naturally, we hope that these brief extracts from the famous JOURNAL OF JON EVERARD *will whet your* *appetite for the whole wonderful story. You can have copies sent to you in two handsome cloth-bound volumes. Simply fill in the form below and mail it to us.* SEND NO MONEY *until you have inspected this bargain of a lifetime at your leisure in your own home.*

Escape from the long winter evenings on golden journeys through time with Jon Everard to meet face to face many of the greatest men who ever lived.

When he had finished reading the shiny brochure, Jon Everard pursed his lips and laid it on his desk.

He looked at the Visitor, who eagerly and a little nervously awaited his comment.

"An ill-judged selection, I'm afraid, Mr. Bernstein. Certainly not the best of my passages, and the balance is poor. And that cheapjack get-the-customer-hooked gimmick is deplorable."

Bernstein looked crestfallen.

"Of course, some of the advertising copywriters do tend to lack taste, Mr. Everard. But their job is to sell the book to the widest possible public. They have to set their sights low . . . But that wasn't very tactful, was it? I'm making a mess of this. I thought bringing that brochure was a good idea. It would show you at a glance that you would become the most famous and popular diarist since Pepys. Maybe I should have brought one of the tooled leather editions —"

"No, it's all right," cut in Everard. "You did well. Forgive my carping. My nerves have been in poor shape lately."

"Yes, I know. I must be your greatest fan, Mr. Everard. I know your Journal almost by heart. I can tell from the tone that around this period you had a bout of nervous depression, although you didn't record it in so many words."

"It showed, huh?"

"It seemed to me you'd gotten in the way of measuring yourself against these great men you were meeting, to your own detriment. You were losing the sense of your own worth. That's why I picked on this period to come back and show you that, probably quite unconsciously, you were writing a masterpiece. None of your successors has accomplished anything like it. I know I'll never be able to touch it, though I do keep a Journal. I'm still green at the job. Frankly, I hoped to pick up a few personal tips from you, as you did from van Gogh."

"This visit is one of your holiday choices?"

"Yes. The very first. The University doubted you needed encouragement, and refused to sanction an official journey. You know what these things cost. There's always trouble over expense."

Jon Everard nodded. "Then I shan't make the account any heavier for you by insisting on going for a peek-a-boo at your world. Sounds like the same old world, anyhow. Thanks for calling, Mr. Bernstein."

Bernstein unhappily felt he was being dismissed. He hesitated.

Everard read his thoughts, and smiled kindly at him.

"I'd like to be able to help you, son, but nothing I could say would be of any practical use to you. It's such a personal kind of job that everyone's approach is bound to be different, according to their nature. Experience is the only teacher. So concentrate on developing into the first Bernstein rather than a second Everard. If it'll increase your confidence, I'll tell you this: in all my travels I never had a cold welcome . . . What's the reading on your chronometer?"

Bernstein started, then inspected a dial on his tape recorder.

"Twenty-one minutes, thirty-five seconds."

"Play safe and set a round twenty-five on your Eraser," Everard advised.

Bernstein fumbled in his jacket pocket. Then he flushed.

"I really am a fool. I've forgotten to bring it. I was so eager to meet you, came away in a rush . . . Now I'll have to go back and get it."

"And add another fifteen thousand to the account?"

"Closer to forty thousand these days—that is, in *my* days," said Bernstein, gloomily. "The Governors will be mad at me for making a costly boob like this, especially on a privilege trip. Nevertheless, even if they fire me, I shall never regret making this trip."

"They need never know about it," smiled Everard. "You can use my Eraser."

He went across to his chronocabinet. It looked like a telephone booth in the corner. It was meant to look as ordinary as that, to avoid arousing curiosity. For Jon Everard was the first official Visitor, and at this time his reports were on the Restricted List.

He pulled the door open and patted a leather holster fixed to its inner side.

"Here's one tip, anyhow. Keep your Eraser stowed in the chronocab itself. Then you can't very well leave it behind."

"Thanks, I'll do that, Mr. Everard."

Everard pulled the pistol-shaped Eraser from the holster. The dial in its butt gleamed as it caught the light. He turned a knurled knob to set the pointer.

"Twenty-five minutes." He handed the instrument to Bernstein.

Bernstein checked. "Right."

Everard returned to his desk, settled back comfortably in his chair.

"It must be a relief for you to skip the explanation this one time," he said. "I always find that a tough chore. Sometimes they're a little afraid in case I'm going to kill them. Make sure you replace that Eraser in my chronocab—don't stick it in your pocket and take it with you. O.K., I'm relaxed now. Fire when ready."

He closed his eyes with a kind of deliberate finality.

Bernstein thought: he doesn't want to see me any more. Maybe *he* never had a cold welcome, but I've had warmer ones than this. Not even a good-by handshake. I tell him he's my idol—and it doesn't mean a thing. He's decent enough, sure—but I thought we'd have such a lot to talk about. Thought I'd be here all day. Twenty-five minutes!"

He walked behind Everard's chair, pressed the point of the Eraser against the nape of Everard's neck, thumbed the button.

The force-field of an Eraser sets up a block in the prefrontal area of the brain, eliminating the neuron paths consciously recorded within any set period. The subconscious retains the relevant memories but they can never re-emerge into consciousness: the bridges are down.

There was no visible reaction from Everard, but that was normal. Mental numbness usually persisted for three or four minutes after the shock. An artist, say, would awaken on his studio couch and imagine he'd merely fallen asleep. Whether he had been robbed of a few hours of his working life by sleep or by an Eraser made no odds. His dream life, at any rate, had been enriched, and his work is an embodied dream.

Bernstein pocketed the brochure, then glanced out of the window at the sea in sunlight. He had visualized himself strolling along its margin with his old hero, discussing life and what makes a man great, until those western waters were blood-tinged by the sunset. But sundown was way off, and he must leave Everard and his world, to meet him again only on familiar printed pages.

He sighed, taking a farewell look at the calm, still face. Then he went into the corner by the tall bookcase—and disappeared. It was as though he had stepped through an invisible door into another dimension. And, indeed, this was what had happened. For an invisible projection of his own chronocabinet was located there.

Five seconds later, he re-appeared, flushed and chagrined. He blundered across to Everard's solidly visible chronocabinet, and thrust the Eraser back in its holster. Sentimental mooning, destroying my concentration, will lose me this job yet, he chided himself.

A faint, unobserved smile touched Everard's lips, and was gone.

And then Bernstein, back in his own chronocabinet, was gone also. Everard, waiting for it, had heard the faint rising hum end abruptly with a snap, like a breaking violin string.

He opened his eyes, but no amusement lingered in them. They were sad. He ran his fingers through his hair, then rested his elbows on his desk and brooded.

He had boobed over the Eraser, too. Its battery was flat, and he had intended to replace it before his next trip. But, until Bernstein had attempted to use it on him, he'd forgotten that.

Why, then, had he shammed unconsciousness?

Why hadn't he simply apologized, and replaced the battery?

Pride, covering up that the great Jon Everard, famed as a perfectionist, could make elementary mistakes like a tyro—like Bernstein?

Consideration—to spare the young man further embarrassment?

Opportunism—to make use of foreknowledge?

Egotism—to be able to gloat over his coming election to the Hall of Fame?

No, none of those reasons. They were absurd. For he would be happier minus the memories of the past twenty-five minutes. Fame he desired, and fame would be his—but for the wrong reason. His life-long ambition had been to become a great painter. He had poured his soul into his painting.

But Bernstein had made no mention of Everard, the painter. Neither had the brochure. Therefore, his work could have left no great impression. He had failed and was doomed to fail.

And he hadn't the guts of a Georges Bizet.

As he brooded, he gradually began to understand why he had chosen to stay conscious. Bernstein's visit had succeeded only in imbuing him with a sense of failure and inadequacy. If the Eraser had functioned, it would have left his subconscious mind filled with discouragement, the reverse of what Bernstein had intended. And he would never know why he felt that way.

The instinct for self-preservation had induced him to play possum.

Self-awareness meant that he wasn't chained in bondage to his subconscious. He still had the power of choice. He must try for Bizet's kind of courage, and accept the situation as philosophically as the Frenchman did.

And that same self-awareness told him that there was one great difference: *nothing had broken inside him.*

He must simply learn to adjust. He must learn to exchange the brush for the pen, and become another kind of artist.

He picked up his pen and opened his Journal. He had not yet finished the account of his meeting with Georges Bizet.

He wrote: *The whole point of life is that we all have to try.*

He paused, remembering the words. That brochure was helping him, after all. Yet . . . it was fated, too. The future supported the past just as much as the past supported the future. Cause and effect were like two balancing sides of a Gothic arch. It was nonsense to pretend one came "first."

Yet he still had the power of choice. It made it no less a choice because his future self made that choice.

Time was an edifice, all of a piece, like some vast cathedral, architecturally perfect. Arch beyond arch, myriads of interlocking arches . . .

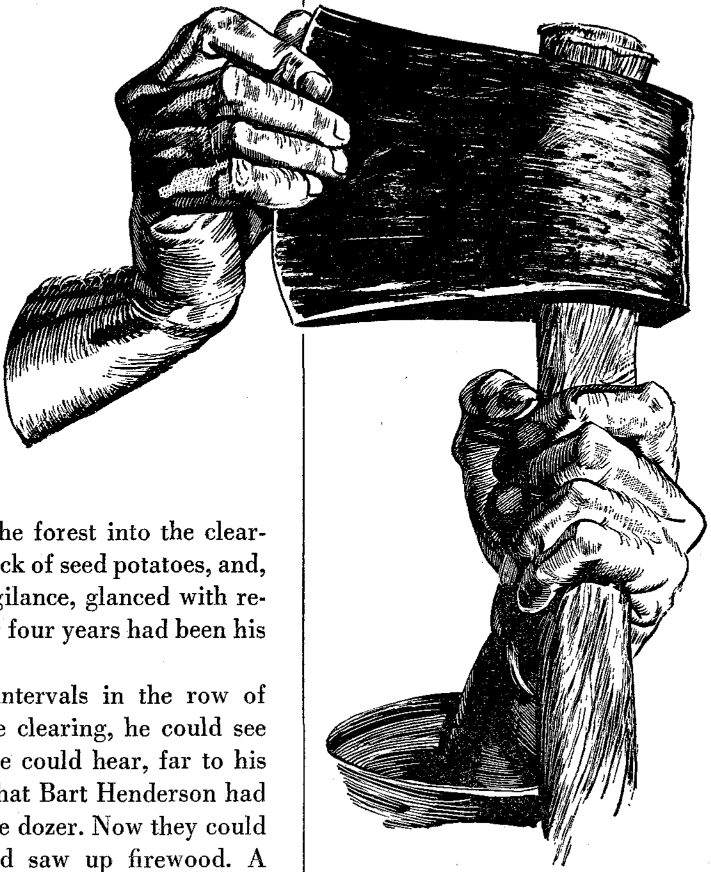
Soon, he told himself, I must visit an architect. Say, Christopher Wren, when the Commissioners for rebuilding London after the Great Fire were doing all they could to thwart his plans for completing St. Paul's Cathedral . . . ■

HUNGER

Plants are necessarily static entities—but they can evolve some highly effective defenses, and they have one great advantage over animals. They aren't hungry . . .

CHRISTOPHER ANVIL

Illustrated by Michael Arndt



Able Andrews stepped out of the forest into the clearing. He set down the heavy sack of seed potatoes, and, after ten days of life-or-death vigilance, glanced with relief around the settlement that for four years had been his home on this brutal world.

Ahead of him, through the intervals in the row of cabins that lined the edge of the clearing, he could see the sunlit, partly-plowed field. He could hear, far to his left, the low rumble that meant that Bart Henderson had somehow, single-handed, fixed the dozer. Now they could plow, cultivate, haul timber and saw up firewood. A wail from a nearby cabin gave proof that his sister's eleven-month-old son had survived his absence, and that Bart had somehow managed to care for the boy while preoccupied with the dozer. And this thought brought back the memory that had been mercifully blotted out by his cat-and-mouse existence in the forest.

To Able's right, he could see part of the double row of rough crosses and stars that marked the low fresh mounds of dirt, all in line with the other older mounds of dirt that stretched across the width of the field to the far side. With sledgehammer force came mental pictures of the endless digging, carrying out of bodies, prying at rocks, chopping at roots, and shoveling back of dirt, and this all blended into one agony with the sickness, the howling wind, the deep drifting snow, and the cold that couldn't be kept out.

Able shut his eyes, then forced himself to look straight ahead at the field, and think of the summer ahead, when they had to do what they could before winter settled in again. He forced himself not to think of all they'd expected to accomplish by now, when actually they were reduced to two grown men, an infant, and a long double row of mounds of dirt.

Able picked up the sack of precious seed potatoes, and started toward the gap between two of the cabins. If they could do well enough with these potatoes and their other crops, they'd have something to offer when fall came. They could strike a bargain, and join up with another settlement where young Bobby could be raised decently—

It was then, while he struggled to patch together a new plan that, as Able's angle of vision shifted, he saw the pool of swamplike useless muck spreading out from the far edge of the clearing, reaching well out into the field to make a heavy blot where the water stood in puddles.

"Merciful God," said Able.

Another step showed him, further to the left, a glint of bluish metal where there should have been trees.

Able's dart gun, which had been slung at his shoulder, abruptly was in his hands.

Above the approaching rumble of the dozer, and the crying of the baby, came a man's unfamiliar voice, carrying a well-developed grown-up whine Able hadn't heard since he'd left civilization. The words, sloppily formed, were spoken with a strange emphasis, so that all Able could make out was the final, "I *won't!*"

A shrill female voice, edged with hysteria, cried, "If *you* won't, I *will*!"

Able glanced swiftly around. For an instant, he thought he must somehow have reached the wrong settlement. But there to the right was the trail to the river, and beside it, the same greenberry bush he'd tended for years. There on the bottom log of the cabin nearby was the same light-brown, arrow-pointed slash, where his foot had slipped while he was chopping, and he'd narrowly escaped losing the foot. Overhead were the broad leaves of the staplenut tree that always lashed the roof of his cabin in a windstorm, and in the distance, over the trees straight ahead, was the familiar pale-blue summit of Carraboon Peak.

This was the settlement, all right. But those were the wrong voices.

He picked up the sack, slipped back to the edge of the clearing, and, gun partly raised, watched the weathered orange bulk of the dozer detour the soggy section, and pass by on the far side of the field.

From somewhere came a low feminine murmur, all but drowned out by the clank and rumble as the dozer, hidden by a cabin, crossed the field, then came into view again on the near side.

The worn canvas side-curtains neatly strapped up, the dozer ground past with Bart Henderson in the cab, leaning back to watch the big plows smoothly turn over the soil.

Able lowered his gun, sucked in his breath, and gave a whistle that began high, shrill, and penetrating, then wavered, and very gradually descended by eerie stages.

The dozer stopped with a clank.

There was the thud of feet hitting the ground, then silence.

Able watched alertly.

A slender figure, gun in hand, slipped around a corner of a cabin, to vanish in a clump of brush.

In a low voice, Able called, *"Bart."*

"Abe?"

"Over here."

The slender figure stepped out in the open, glanced around, then, grinning, walked swiftly closer.

"Abe, you son-of-a-gun! You whistled like a wire bird?"

"I wanted to get your attention without going out in the open. Listen—"

Bart saw the sack. "What did you get?"

Able frowned, then bent to undo the thong at the neck of the sack.

"Ah," said Bart, crouching to look over the seed potatoes. "You did well."

From somewhere, Able could hear a murmur of voices.

Bart stood up and grinned. "That's better than grinding up staplenut meats and filtering the meal a dozen times to get the sting out. Or guarding the cornfield day and night to keep away the pests. Boy, I'm glad you made it! I was afraid you were finished."

"Yeah," said Able, frowning. "Bart, listen—"

"How were things at Six?"

Able blinked. "Not good." He pinched the right sleeve of his leather shirt, to show two small punctures that fit over each other as if a thin, very sharp nail had been driven through. "There was enough poison on the end of that dart to finish a dozen settlements. All they had to do was come an inch closer.'

Bart swore. "They shot at you?"

Able nodded. "They think any stranger must be a carrier of the sickness. They haven't had that yet."

"But, then, where'd you get the seed potatoes?" Bart asked.

"I went another twenty miles to West Seven."

"All that way through the forest?"

"I don't know any other way to get there."

"How were they there?"

Able shook his head. "They're in a mess. They were down to twelve couples last summer. And the fools had left a belt of wire trees on three sides of the clearing. They claimed it kept the carraboons out of the crops. Well, a hunting party was late getting back a few weeks ago, a thick fog came down, the men lost the trail, and wire trees polished off four of them. Last winter, the sickness had carried off four of the women."

Bart shook his head. "Well, that leaves them eight couples. And they're immune, now, so—"

"They're immune to the sickness. But they don't have eight couples."

"They were down to twelve last summer. They've lost four men and four women. Four from twelve leaves eight."

"The four men the wire trees got weren't the husbands of the women the sickness killed. They were *other* men. That makes eight unattached men and women."

"Well—"

"Sally," said Able dryly, "has a yen for Bill. Bill likes Greta. Greta's trying to get Mike's eye. Mike always did like Bernice. Bernice is mourning for Dave. Meanwhile, Edna—"

Bart shut his eyes.

Able said, "If I looked at any one of those women for more than about ten seconds, someone started loading his gun. There were eight women there, and one of them made it a point to be friendly. I tell you, I made the trade and cleared out fast."

Bart grinned. "Why didn't you bring one back? The friendly one."

"What, loaded down with a sack of potatoes? In strange country, with eight of their men to one of me? And forty miles of wire trees between me and home?"

Bart laughed. "Well, you could have—"

The unfamiliar male voice, that had startled Able earlier, again rose over the clearing, the words slurred so that it took an instant to make out the meaning:

"But, Lennie, the doctor *told* me to get a change of scene! My nerves are gone, absolutely *gone,* I tell you! A man's system can stand just so much! Really, we've hardly *gotten* here, and now *she* wants to go back. How am I supposed to—"

Able glanced around, his gun ready.

Bart shook his head wearily. "I forgot. Step over here a little further to the right."

Able picked up the sack and followed Bart to a spot where they could look out at an angle between the two end cabins. Across the clearing to their left was a glittering metallic structure, shining in shades of blue, pink, and violet, with a dazzling strip of yellow, that Able for a moment couldn't get into focus. Then the thing resolved into a variety of shapes he could recognize, and involuntarily, he swore.

Like a forty-foot-square chunk of luxury vacation resort, sat a raised swimming pool with diving board, a fifteen-foot strip of dazzling sand, a screened-in porch that jutted out at an angle part way over the pool, and, visible on a sort of outthrust metal terrace beside the pool, several beach chairs, a chaise longue, a round table with big candy-striped umbrella, and a stand bearing a frosted carafe and three full glasses.

"Where in hell—" said Able, and then bit off the rest as he saw in the background, with multicolored pennants fluttering in the breeze, the space yacht out of which this collapsible paradise must have everted itself.

"How long has this been here?"

"It came down the day after you left. A man's voice called, 'O.K. if we set up here?', and I said 'Sure.' I was glad to hear a human voice. There was a kind of grunt, and that was all they had to say. A set of slits appeared in the side of the space yacht, the side opened out, and then the damnedest collection of rods, metal plates, screens, tubes, and loops of wire, pushed out from inside, thrust into various positions, there was a series of loud clicks and snaps, and a continuous sliding noise, with more stuff pushing out from inside, and in about twenty minutes, there it sat, just as you see it now."

Able studied the yacht.

"What potentate could afford a thing like that?"

"Oh," said Bart dryly, "the guy's a circuit element."

"A *what?*"

"On the left side of his head, and in one or two other places, there are half-inch circular spots where the hair doesn't grow, with two or three small, dead-white dots forming regular patterns in the centers of these half-inch spots."

Able frowned, trying to pin down an elusive memory.

Bart said, "When we were shipping out, they were advertising for volunteers to test for 'brain-circuit characteristics,' remember?"

"Vaguely."

"The idea was that certain characteristics of the human brain were useful in computer construction, but very expensive to duplicate artificially. So they were trying what I think they called a 'hybrid linkage'. If the characteristics of a volunteer's brain happened to be right, he signed a waiver, they in effect plugged him into the circuit, and then they used him until either his contract ran out, his brain characteristics slid out of adjustment, or their needs changed. In return, he got a huge payment, and a pension for life."

Able studied the space-yacht as the meaning of this sank in.

Bart said, "Naturally, they didn't pick those people for intelligence, any more than you select a transistor or a vacuum tube because the thing is smart."

Able looked at the soggy muck spreading out from the base of the pool.

Bart said, "This boob has a yacht equipped with nuclear reactors, forcescreens, heat-rays, and heaven only knows what other little necessities of life, that he can misuse at our expense any time. Look there!"

Able saw a little blue-and-white skimmer, its slender legs holding its gliding-membrane taut, streak almost horizontally toward the roof of the porch that jutted out at an angle over the pool.

There was a dazzling flash, the skimmer's fur burst into flame, and its forward motion slowed so rapidly that it dropped almost vertically, to splash into a marshlike puddle.

"Now," said Bart, "brace yourself."

There was a metallic rattle, then a recorded voice boomed across the field:

"Your attention, please. This vessel is fully protected by appropriate devices of the Advanced Synodic Products Corporation. It will retaliate automatically against any aggressive or hostile action."

Able stared at the remains of the little skimmer, lying in a puddle of water.

Atop the nose of the towering space-yacht, a variable-beam energy-cannon retracted into its housing.

Able glanced around wonderingly, and for the first time saw around the yacht's pool and porch, the thin long and thick short rods of a noise-suppressor. Whatever happened out here, it wouldn't disturb their sleep in there. A mirage-like, white fluffy cloud, drifting apparently between the yacht and the trees behind it, told of another device that created, at the owner's pleasure, the illusion of a different outside scene.

Able glanced at the dead skimmer. "What's next?"

"I don't know. This business has happened dozens of times, but it's never gone any further."

Able's attention was caught by a blur of blue and white.

A second skimmer, this one gliding considerably higher, streaked across the clearing.

There was a dazzling flash.

The skimmer's fur burst into flame, and so, too, did a chunk of knobby, irregular, pale-blue tree trunk in the line of fire, across the clearing.

"Watch out," said Bart. "If that seed-knot cooks off—"

By the edge of the pool, a flabbily-built man wearing purple shorts, sun-glasses, a green sport shirt with violet pattern, knee-length socks and bedroom slippers, walked out onto the outthrust terrace, and flopped down in a beach chair.

Bart murmured, "If only it could have hit any tree but a dead bitchwood—"

Following the man, face flushed and angry, came a woman with the build of a starved model, wearing a two-piece bathing suit.

The man waved his hand at her as if brushing away gnats, and picked up a glass.

The woman leaned forward to say something.

"*New*," said the man loudly, apparently meaning "No." He looked away.

She said, "Won't you let me—"

"I *won't*"

"At least listen—"

"*New*!"

"But—"

"Go away! Shut up!"

She straightened angrily. "You can go to hell!"

The man's body remained in the same position, but his head turned around. He threw the glass in her face.

The yacht's loud-speaker gave its metallic rattle.

The energy cannon loomed out of its housing.

The burning tree hissed, and a plume of white vapor spurted out from a pineapple-size bump faced toward the space-yacht.

Bart swore. "Sure as rats and blizzards, that seed-knot is going to blow."

"Your attention," said a loud, recorded voice. "Any further provocation—"

A menacing hiss came from the section of burning tree. The flames climbed higher up the trunk, reaching for new bumps and protrusions.

"Grab that sack," said Bart. "Get farther back in the woods!"

"The baby—"

There was a loud *bang* from the tree. A shotgun-like blast of nut-size seeds sprayed across the clearing.

The cannon swiveled in a blur of motion. There were a dozen bright flashes.

"No time!" yelled Bart. "He's safe inside. Once those other knots cook off—"

Able swiftly measured the distance with his eyes. He shook his head, grabbed the sack and ran at an angle away from the burning tree.

Whoom!

A shaft of pink radiance lit the burning tree and a dozen others around it. A moment later, they were all on fire.

The recorded voice went on "... If this molestation does not cease within three minutes, strong measures will be..."

Bang! Another seed-knot cooked off. Bang! *Bang!*

Small, hard, nut-sized objects whizzed and droned overhead, hit tree trunks with a sharp cracking noise, and bounced and ricocheted in all directions.

Able landed hard and rolled behind a big tree. It was by far the best cover in sight, and Bart was already there.

Whoom!

Flaming branches dropped all around them.

A machine gun banging and hammering opened up as fresh bitchwood trees caught fire and put their emergency reproductive method into action.

Somewhere near, there was a hissing, sizzling, noise.

"That does it," said Bart. "They've set a staplenut on fire."

Able peered cautiously around, and sniffed. "Which way is the wind?"

"Straight for us. Once that green sap starts to boil—"

Able glanced behind him, where the seeds flashed through the air, tearing up the leaves and dirt when they hit.

"We can't go back there—"

A pale-green foglike cloud drifted forward, the first faint wisps charged with a stinging odor that brought white flashes and a flood of tears to the eyes, a searing sensation to mouth and nose, a hot tight thickness to the lungs, and a general sense of being trapped in a constricted hole, unable to move or breathe or—

Able was running headlong, flying objects whizzing around him. Something rapped the back of his head like a hammer. He lost his balance, plunged down a steep slope, barely missing slamming head-first into a tree trunk, then something twisted crosswise under his feet, and he threw himself forward with every ounce of strength he had.

There was a singing, creaking noise. The air filled with a cloud of dead leaves and dust, and there was a multiple crack like the lash of a dozen whips.

Able sucked in a ragged breath. "*Wire tree!* Look out! *Wire tree!*"

A peculiar shrill high-pitched whistle sounded overhead, carried over the hiss, bang, and *whoom* from behind them, wavered, and descended by slow eerie stages.

Able wiped his eyes and looked up.

Some forty feet away, the veined green bole of a wire tree rose from the forest floor, its many tiny leaflets casting a pattern of flickering hypnotic shadows on the ground. Around the trunk was a wide circle where the dirt boiled, and small pebbles danced in the air. Overhead a large bird with big claws and curving red beak dropped from limb to limb, head turned sidewise to peer hopefully into the blur of the thrashing trap roots.

"That was *close.*" said Bart, clinging to a nearby tree trunk and gasping for breath.

"Don't move," said Able. "Look behind you."

Thirty feet away in the other direction stood a veined green trunk, flickering shadows moving hypnotically over the ground nearby.

Bart looked, turned and said suddenly, "Where are the seed-potatoes?"

Able looked at him. "If you think you could have carried them through that—"

"It isn't that. Listen."

Above the sizzling and banging, and the boom of a loud-speaker back at the clearing, came the chortle of a skimmer calling its fellows to a feast.

Able stared at the interlacing streaks, and the black objects bouncing over the edge of the slope. To go up there now would be suicide.

He shook his head. "I left the sack by the big tree. I couldn't have carried it through that."

"It isn't your fault, Abe. I should have helped carry it."

"You couldn't have. It would have been too slow. We'd have been pelted to death in the first twenty seconds."

Bart stared up the hill.

Able, thinking back, could think of nothing he might have done differently. Taking the one choice open to him at each turn, he was inevitably led into this mess.

From up the hill, apparently in the shelter of the big tree, came the chatter and chortle of a horde of feasting skimmers.

Bart said, "If I can run fast enough—"

"Look at that haze blowing past up there. The skimmer's evolved in this place. That boiling sap just makes their eyes water a little. If either of us goes up there, we'll strangle on the first breath."

"That's true," said Bart. A moment later, he said tensely, "But, do we have to just stand here while we lose our last chance—"

A distant, carrying voice boomed. "Any future hostile action on your part will be crushed with a severity equal to that you have just experienced. Let this warning be sufficient."

Able shut his eyes. He took a slow quiet breath. When he looked around again, the trap roots were burying themselves in the dirt for the next try.

From the direction of the clearing came the wail of a terrified baby.

Able said, "I've got to try to get back. Maybe I can work around the worst of this. When that smoke and the seeds let up—if you could get back to that tree—"

Bart nodded. "Be careful. Some of those wire trees we finished off after we landed are sprouting from the stump. Sometimes you don't see them till you're on top of them. The trap roots are only thick as threads, but they're ugly to get free of."

"I'll be careful."

"Good luck."

Five hours later Able and Bart stood amongst the bare clay-mortared stone chimneys, their faces red from the heat of the glowing coals and smoking ends of logs that had been cabins. Nearby, plastered with steaming mud, stood the one remaining building, the thick-walled and heavy-roofed storage cabin. On three sides of the clearing stood the charred sticks of bitchwood trees, and here and there a smoldering staplenut spat green foam that boiled away in clouds.

Able glanced at the dozer, its paint seared off on top and side, the roof of the cab melted down, and the metal mud-shield on one side welded to the track.

Behind them, the baby was crying. Able had gotten him out just before the tree fell on the burning cabin roof.

Bart said, "What a mess. We've got only a few potatoes. The dozer won't go anywhere till we fix the track. We don't have the equipment to do that right, so whatever we grow, we'll have to raise it by hand. But there're only two of us to cultivate and guard the crop, so we won't have enough, even if everything works out, to join up with another settlement. We've got nothing to offer except three hungry mouths."

Able was studying the space-yacht, noting the late afternoon sun slanting on the fluttering sunshade. On the diving board stood a shapely girl in a two-piece swimsuit and white bathing cap. Her intelligent face showed a slight wrinkling of the nose as she posed on the board.

"The wind," said Bart, "let up just then."

Able glanced at the curving line of dead animals in the muddy water outside the base of the pool.

"Where," said Able, "does that water come from?"

"The pool. The first few days, the water was recirculated, but apparently a filter gave out. The boob there . . ."

Able noticed the man in the chaise lounge, making expansive gestures as the thin woman nodded hasty agreement.

"...The boob there," said Bart, "threw a fit, and blamed the woman, but the girl said maybe they could drain off some of the water to keep it clean. She set the mechanism so a trickle came off. The boob reset it so a flood came out."

"There are just the three of them?"

"That's all I've seen."

"What relation are they?"

"The thin woman is the cretin's wife. The girl is the wife's kid sister. They had a sisterly talk one night, and it sounded as though life was never any bed of roses for them, but since Mort—the husband—made his windfall, they've been loaded with money, and the husband has been threatening to go nuts. He's got all kinds of luxuries, doesn't have to lift a finger, isn't happy, and just naturally blames the wife."

Able studied the two. "Is the wife sick?"

"I don't think so," said Bart. "Why?"

"She's so thin."

"What would your digestion be like if you were a woman married to that?"

Able nodded. Across the way, an argument had sprung up, making him wish the focused compression-waves of the noise-suppressors worked on outgoing as well as incoming sounds.

The girl, scowling, climbed out of the pool, and said, "Lana—"

Trembling, the woman looked at her. "What is it, Helen?"

The man, frowning, glanced at the girl. His bad humor evaporated. "What's the trouble, Lennie?"

"Did you notice that smell?"

The woman shook her head.

"Yeah," said the man. "I got a whiff of it. Something dead."

The girl frowned. "Do you suppose we'd better take a look?"

Able glanced at Bart. "Can they see anything at all out here?"

Bart shrugged. "I yelled my head off when the water started pouring out. I was as close as I could get without getting cooked by that cannon. They didn't hear me or see me, even though they looked through me half-a-dozen times."

On the terrace, the man was saying, "Why bother? It's just the gobbies. They don't live very sanitary, you know."

Able said, " 'Gobbies.' What's that?"

"His name for 'mud-footed settlers'."

The girl said stubbornly, "They might need help."

The woman glanced at her husband.

The man stiffened. "Nuts to that. What am I, a settler's aid fund? If they want to lay around in their own filth, that's their look-out."

The woman said, "Please, Helen—"

"They may need help."

The man's voice rose in pitch. "For Pete's sake, Lennie, can't a guy relax? So what if they butchered a dog and they're too lazy to bury the guts? Most of these gobbies are criminals and defectives, anyway. You want to load all that on me? I say it is none of our business."

Bart passed a hand over his face.

Able was studying the energy-cannon in its housing atop the nose of the ship. He looked down at the big doors where the porch and pool thrust out of the yacht, looked hard at the fluttering sunshade and the long shadows cast on the side of the ship, then studied the dozer.

"Please, Helen," the woman was saying, "Don't . . . Don't make him . . ."

The man shouted, "Don't make me *what?"*

The girl frowned and sniffed. That the air now seemed fresh to her appeared likely, since the stench was now blowing full in the faces of Bart and Able, the wind carrying it away from the ship.

Able glanced at Bart. "Did you notice that the rear power take-off on that dozer is clear of the wreckage, and the big flat metal plate over the converter housing is undamaged? What's to prevent us from connecting the grinder attachment to the take-off, and reaching in through that shambles to work the control-lever?"

"What's the use? We can't go anywhere till we fix the track."

"I was thinking we could fix it if we had that ship. And by simple right of self-defense—"

Bart stared at him. "But how? We can't *touch* that yacht. We could have a dozen rocket-launchers and an old-style army division here. It wouldn't do more than set off a red light on a board somewhere, which the boob would ignore. The only thing that could get past that force-screen and the energy-cannon would be another energy-cannon. Assuming, that is, they don't have a beam deflector, in which case we'd get the whole works right back in our faces."

"If they had a deflector," said Able, "would they use a shade to keep the sun off?"

Bart frowned at the sunshade. "What are you driving at?"

"The yacht has the advantage in weapons, but a pure-routine computer is running them. It strikes me intelligence still ought to count for something."

"Maybe. But what?"

"Help me bolt on that fine grinder, take the hatch off, find some kind of straight edge and improvise a protractor —and we'll find out."

Both moons—the little distant one, and the big Earth-style one—were up that night, and the big one was full, which helped the work.

They worked most of the night, got a few hours sleep, were up by early dawn, and late afternoon of the next day found them in a deep narrow trench, the baby squalling under cover of a flat rock laid across one end of the trench and heaped with dirt. Two long poles stretched up to a frame of charred wood between two charred trees. The frame held the big metal plate from the dozer, polished mirror-bright and pivoted to turn when Able pulled one of the poles. Two carefully-positioned wooden rests determined the extreme angle the metal plate could turn to. Upright in front of the plate was a dry billet of bitchwood, its explosive seed-knot aimed toward the space-yacht. The second pole held a briskly-burning torch.

"O.K.," said Bart. "The women are safe in the pool. He's inside."

Able moved the torch over, setting the seed-knot ablaze. "O.K. Fire the gun."

Bart bent at a dart gun already armed, wedged in place, and heaped over with dirt. He squeezed the trigger, worked the loading mechanism, squeezed the trigger, again, worked the loading mechanism—

The loud-speaker boomed. "Your attention. This is the only warning you will receive. This vessel is fully protected by—"

Bart squeezed the trigger and worked the loading mechanism.

Able eased farther down behind the thick bank of earth.

WHOOM!

The air lit up pinkly. The bank of earth steamed, particles of dirt at the top jumped like popcorn.

Bang!

The knot let fly its seeds.

The radiance lifted, to shine on the polished metal plate. The charred wood frame caught fire but held its shape.

Able counted seconds.

From across the field came a male yell.

Able pulled back the pole. The plate pivoted.

A choking and coughing drifted across the field.

Able counted slowly, then picked up a long stick lying nearby and knocked loose the smoking rest that held the plate from turning farther. The metal, pivoted slightly off-balance, swung around under its own weight, presenting its narrow edge to the energy beam.

The burning frame began to sag.

Able said, "Quick! Get under cover. When that plate catches the beam and reflects it at random—"

From across the field came choking, gagging, male curses and female screams.

"Shut everything off!" cried the girl's voice. "We've got to get out!"

Abruptly the radiance was gone.

The blazing frame crashed to the ground.

The choking and coughing grew worse.

Bart said, "We must have had the angle right. It sounds like we hit that staplenut dead on."

"Just pray the wind doesn't shift." Able peered out cautiously.

Across the field, a big staplenut tree was on fire, clouds of greenish fumes boiling off to wreathe the yacht. The nearest of the yacht's big cargo doors, where the porch and pool had been thrust out, was discolored, and so buckled as to jam it open. Through the opening, choking fumes swirled in, the gap incidentally posing air-loss problems if the yacht tried to leave the planet.

Stumbling across the field came the woman, then the girl carrying a kind of light-weight rifle, then the man, apparently unarmed.

"O.K.," said Able, picking up little Bobby. "Don't show yourself, but keep him in your sights."

"I still think you need a gun."

"Honey's better than vinegar." Able cradled the baby in his arms, and walked slowly out into the field. The baby let out a scream of discontent.

The girl, her eyes streaming, raised the gun.

Able turned the baby so that it gave a piercing wail that carried across the field.

The woman cried, "Don't shoot, Helen! It's a baby!"

The girl wiped her eyes and stared. She lowered the gun.

Able tried to look friendly, and took pains to keep the baby prominently in view.

The baby kicked and squalled.

The two women came closer, as if drawn despite themselves by some powerful magnet.

Able, his male incompetence glaringly obvious, shifted the baby around as if looking for some handle to get hold of it by.

The baby swung wildly with both fists.

The women, reassured by all this obvious helplessness, came straight for the baby. The girl took the baby, handing the rifle to the thin woman, cuddled the baby and talked to him. The baby stared at her. The thin woman looked longingly at the baby, and shifted the gun around in a way that made Able's back hair tingle.

Able said in a humble, bashful voice, "If you want, ma'am. I'll hold that while you look at the baby."

"Yes," she said, brightening, and Able had the gun. He recognized it as a Model XX Superlight, firing explosive pellets charged with quick-action poison. The selector lever was set at "A" for "automatic," and Able promptly thumbed it back to "S" for "safe."

Across the field, the man from the yacht was wiping his eyes. He saw Able, patted all his pockets in rapid succession, then suddenly jerked a flat oblong thing from a small belt case.

To Able, this thing had the appearance of a hand-communicator. It had a speaker, a telescoping antenna, and he could see a switch at the side. Then, too late, he realized it was too big for a communicator, and might well double as a hand-launcher for acorn grenades.

The man had the telescoping antenna aimed at Able. A sudden realization kept Able from trying to use the gun.

The girl cried, "Why does *he* have the gun? *What's Mort—*"

She screamed.

Across the field, there was a dazzling bluish flash that left a hideous after image.

"Did he shoot Mort?" cried the woman.

Able kept the gun down.

The girl said, "Mort shot himself with the hand-launcher, Lana! I saw him!"

"Oh!" said the woman, and began very quietly to sob.

Bart walked up, carrying the dart-gun inconspicuously, barrel down and stock out of sight under his arm.

Able glanced at the distraught woman. "Don't hurt the baby."

"Oh, yes, the baby." The woman cuddled it. "I'm sorry, honey, I'm sorry. Oh, Helen, Mort was *so* unhappy!"

Able said, "There's staplenut milk over there in the cabin, if the baby is hungry." He glanced at the girl, who was studying him curiously. "But," he said, "whatever you do, don't go in the forest. There are trees on this planet that have contractile false roots that can whip and squeeze you to death, and crush you into fertilizer in no time."

The girl put her hand out for the gun.

Able held the gun out to her. "Keep it on 'Safe.' It won't hurt the trees, and we're the only people left in this settlement."

She smiled and let her hand drop. "Keep it. I guess you know what you're doing."

Able blinked. The two women went toward the cabin, carrying the baby, which was making gurgling noises instead of the usual screams.

Bart and Able cautiously approached the space-yacht. Able tossed a rock, which landed, unharmed, near the base of the pool.

Bart said, "I would never have expected him to shoot *himself*. I fired at him, and missed. I thought he was going to shoot you, and incidentally blow up the women and the baby."

"He was," said Able. "He forgot the launcher was dual purpose, the top part all communicator. *He aimed the wrong end.*"

Bart shut his eyes.

"Look," said Able, "the wind's veered around. We can go up that ramp without getting gassed."

An hour later, they'd explored the ship, locked the control board, stopped the flood of water pouring out on the field, and were standing on the terrace by the edge of the pool. Around them they saw, not the clearing, but a moonlit beach scene, with couples lying on blankets, bonfires in the distance, radios playing softly, and white foam swirling far up a long smooth beach. Able, studying a console that stood under the porch, finally spotted a lighted button marked "Local." He pushed it, the beach scene disappeared, and there was the clearing.

Bart said softly, "Look at that water. What's to prevent our taking a swim?"

"Nothing I can think of."

"Look, there's a *shower*. Over there, in the corner under the porch."

"I see it."

"Ye gods, think of it—the ship has a machine-shop, three or four book-viewers, dozens of library cubes, soft beds with real sheets, a kitchen, enough food concentrates, staples, and luxuries to last years, medicines of all kinds, electricity, hot and cold running water, plus all this out here—*and he wasn't happy!*"

Able nodded.

Bart said, "How could anyone have all this and *not be happy?*"

"I suppose happiness doesn't come in one piece, like a rock. It has parts—like an axe, with a head and a handle. And generally either part alone isn't enough."

"What are the parts?"

"Well, look how miserable we were, for lack of material things. And look how miserable he was, for lack of self-control."

"Hm-m-m," said Bart, staring off across the field, where a soft glow showed that the women had discovered the lamp. "I never thought of that. But, say material advantages make up the head of the axe, and self-control is the handle. There's still something missing. What about that little wedge that's driven in to keep the head of the axe from coming loose?"

"Well, that's clear enough," said Able, glancing at the lighted cabin. "Life is full of these little tricks. What happens when somebody *does* get happiness? As likely as not, the handle of self-control shrinks up, the head of material goods flies off and sinks itself in his foot, he lets out a yell, throws the handle fifty feet, and there's the end of it.

"But take the people who have found happiness and seem to keep it. How do they do it? It appears that, regardless of their means, *they think and work hard.* The thought and work, in turn, generate hunger—a need for food, rest, comfort. I'd say the little wedge that holds happiness together is *hunger.* Without that, the biggest feast is just so much grease and indigestion."

Bart thought it over, then nodded. "Back home," he said, "they're always talking about 'abolishing hunger.' They might think about it some more."

Bart and Able took another glance at the pool, the terrace, and the treasure-laden ship, then started back across the field.

"Thanksgiving dinner," said Bart thoughtfully, "isn't worth much unless you work up an appetite."

"True enough," said Able. Then his mind abruptly descended to details. "Watch it. We don't want to land in that crater where the acorn-grenade went off."

They veered sharply to one side. "Glad you remembered *that*," said Bart.

Able glanced at the softly-lighted cabin ahead, and considered another little detail. He and Bart were two men, and, in the cabin there, were two women. He remembered the mess at West Seven, and winced. Philosophy, such as he and Bart had been talking about, was strong stuff—but if there was anything to turn it inside out, it was women.

Still, he told himself, there were only *two* of them.

Maybe they'd get through this alive yet.

Able and Bart crossed the field, and gently—warily—rapped on the cabin door. ■

THE PROBLEM OF THE GYROSCOPIC EARTH

continued from page 16

equator, too, are locked in space, then rotation of the Ecliptic means that the Declination of the Sun for mid-summer and mid-winter ranges north and south more and more widely, and our present 23½° range is a purely temporary business. The two extreme cases will be: Declination 0° throughout the year, which I would term the "Equatorial" phase; this slowly changing at the rate of 1″ arc in 155.5 years into the "Uranus" phase where declination ranges from 90° N. to 90° S. during Earth's twelve-month orbit of the Sun.

These are the vicissitudes that life has always had to adapt to meet, continually, throughout all its long history. And this is why any too-well adjusted species is so liable to get snuffed out. Also, maybe, since the changes are gradual, this may be the way some species of animal and bird have learned complicated tricks of living: more and more complicated cells for the bees; wider-ranging migrations for animals and birds, et cetera.

At first glance one might suppose that the Uranus Phase would develop the most extreme temperature ranges of the whole galactic orbit? I take leave to doubt this, however, for the following reasons:

1. Temperature at any point is more often controlled by where the winds come from than by the actual insolation received. Otherwise the British Isles would be as cold in the winter as Canada.
2. The Polar Caps would be hard put to survive a month or two of vertical or near-vertical sun without marked shrinking.
3. The real determiner whether an ice cap survives is the algebraic sum of:
    1. The supply of fresh snow in winter;

   minus: 2. the run-off of melted ice in summer.

   (Oddly enough Antarctica might unfreeze at a greater rate than the Arctic, because the fresh water of the run-off would get mixed with and carried off in the salt ocean surrounding it, whereas in the Arctic it tends to lower the concentration of sea salt and is anyway supplemented when the Asiatic rivers unfreeze and flow into the Arctic Ocean.)
4. The odds are that Earth's climate will settle into a global Monsoon, with its center of low pressure over the light pole. The dark pole becoming the center of an anticyclone, with descending air. The whole stretch in between, across the equator, a zone of steady winds changing direction only as they cross the equator, and, in the Northern Hemisphere, blowing as steady Southwesterlies.
5. The continental shelves would be submerged under the unloosed water from the poles which would penetrate the whole land structure and would carry an oceanic stabilizing effect everywhere.

   N.B. The inter-tropic Highs would probably disperse, as the one in the Indian Ocean does now, once the Asiatic Monsoon gets established. The result might well be that many present day deserts would get rain again, and that the only deserts in this phase would be those under the lee of mountain chains.
5. It is a debatable point whether dense air over the dark pole could form a shield over it against the warming Föhn effect of the descending air heated adiabatically. But wherever these get to the surface the ice would rot away rapidly.

In any case *can Polar Caps exist on any planet anywhere in the Universe except in two special cases:*

1. Land-locked Oceans with shallow entrance-sills?
2. A continent or archipelago at the pole?

As it happens we've got both. So we may be prejudiced and think that ice caps are normal. But the odds are that they are rare. Normally-cooled-water sinks and gets away over the bottom to the tropics.

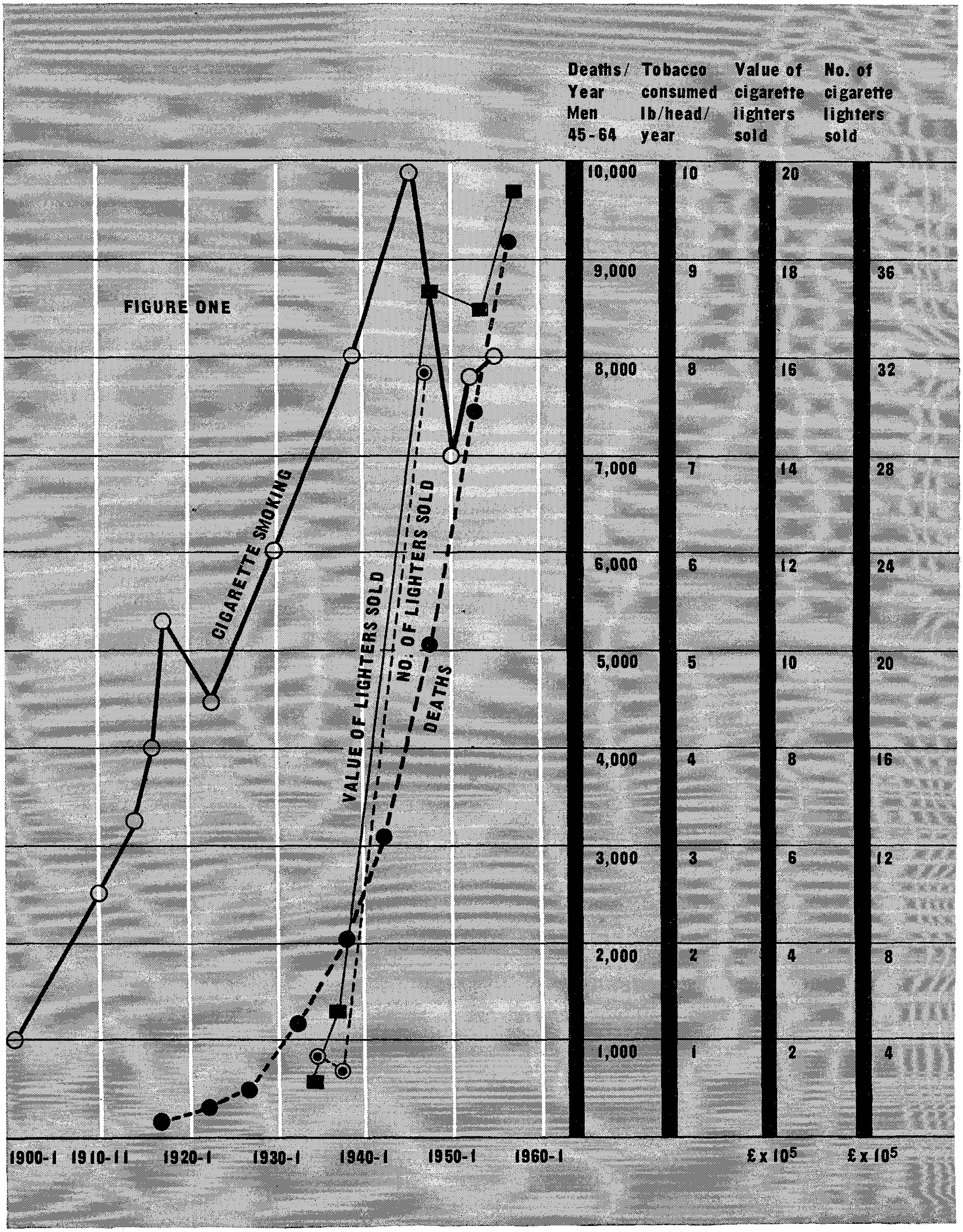
I would have liked very much to go on and show how the change that must occur in the lunar orbit causes the East-West fold mountains of Mother Earth: removal of the Moon from an equatorial to a trans-polar orbit would allow part at any rate of Earth's "bulge" to collapse, and the surface would have to fold to accommodate itself to the smaller area. How the axial change of the Moon—a trans-polar body in the Uranus phase, but which must still keep the same face turned towards Earth always, even if its orbit has altered 90°—might cause the fold mountains that run north and south, and even account for the somewhat "lipstick-mark" shape of the Andes and Rockies as seen from space.

Also to have argued that there is sufficient evidence to prove that Sol's Galactic orbit is a rather long ellipse, and not one that is nearly circular, because the onset of full ice-ages seems to occur once per revolution of the Galaxy instead of twice. To have traced out what a mid-winter night might look like at the dark pole, the Moon taking a week to rise in a slow helix up the sky to reach the zenith—Full Moon—and take a week to go down again and circuit the skyline at its last quarter.

Also the gradual increasing range of "migration," either side of the equator, learned gradually by birds and whales et cetera, either because they found it essential for survival or they just drifted into it.

But I fancy enough clues have been given to let everyone have his own fun working out the rest of the results for himself.

Perhaps there is one more I ought to mention: Is it just a coincidence that the Moon's mass is of the same order of magnitude as the mass involved in the fold-mountains of Earth—including their "roots" of course? ■


Deaths/ Year Men 45-64
Tobacco consumed lb/head/ year
Value of cigarette lighters sold
No. of cigarette lighters sold
FIGURE ONE
CIGARETTE SMOKING
VALUE OF LIGHTERS SOLD
NO. OF LIGHTERS SOLD
DEATHS
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
10
9
8
7
6
5
4
3
2
1
20
18
16
14
12
10
8
6
4
2
36
32
28
24
20
16
12
8
4
1900-1
1910-11
1920-1
1930-1
1940-1
1950-1
1960-1
£ x 10⁵
£ x 10⁵

Possible relationships between smoking and lung cancer

I. D. MURRAY

The problem of the correlation of tobacco smoking and lung cancer is a very complex one indeed—and of personal interest to many people.

Not the least of the difficulties is that statistical study can only demonstrate that "A goes with B," but give no clue as to whether A causes B, or B causes A.

Thus it may be that, actually, tobacco smoking tends to suppress cancer, and individuals with a high cancer tendency intuitively take to smoking as a defense!

Notice that a study of statistics will show that users of tranquilizer pills are far more prone to acute nervous tension than nonusers. This shows tranquilizers cause nervousness? And people who take insulin, it can be shown, almost invariably suffer from diabetes.

My personal opinion is that the A.M.A. has done an inadequate job of evaluating the problem, and has come to some loudly stated, but poorly substantiated conclusions.

[The Editor]

There is now little room for doubt that there is a causal relationship between smoking and lung cancer. This has led to much publicity against smoking. However, the most important short-term objective appears to be to decrease the risk of smoking, since smokers tend to cling to the habit,[2] and it will, therefore, take a long time to abolish.

If measures to protect smokers are to be effective, it is necessary to know what the causative agents are and, if possible, the mechanism of absorption. This we do not know at the moment, as is evidenced by the quotation ". . . the amount of cancer-producing substances in the smoke itself does not seem sufficient to account for the large number of cases of cancer associated with the habit."[3] Whatever the reason, this situation is not through lack of trying.

There are a number of important anomalies in the published figures for which no satisfactory explanation has been given, and it is the purpose of this paper to show that these are consistent with the hypothesis that there is a major cause of lung cancer which stems from the habits of smokers rather than from the constituents of tobacco smoke as normally inhaled. As it were, a second-order causality, something which only some smokers do.

The anomalies mentioned above are as follows:

(1) Cigarette smokers are three to four times as liable to lung cancer as pipe smokers, and pipe smokers three to four times as liable as nonsmokers.[4] Cigar smokers appear to be no more liable than nonsmokers.[4] This surely is a tremendous variation in view of the fact that pipe and cigarette tobaccos are largely derived from leaf from the same plants, cured in the same way. The position of pipe smokers is particularly anomalous, as pipes are a natural trap for tar, etcetera, and tar condensed from tobacco smoke can produce skin cancer in animals, whereas exposure of animals to tobacco smoke has not so far produced lung cancer.[3] Also, a cigarette, which is thrown away, would seem to be a more hygienic way of smoking.

(2) The effect of inhaling, if any, has not been established with any certainty,[5] despite the fact that on tests of nicotine absorption it was found that as much as ninety per cent may be absorbed if smoke is inhaled, whereas as little as ten per cent may be absorbed if it is not. Similar results would on the face of it be expected as regards any carcinogens present, and, as the site of the cancer is the lungs, it is difficult to see how inhaling

could fail to be a significant factor if the smoke contains the main causative agent. We would, in fact, expect to see a difference between inhalers and noninhalers, of the order of magnitude of that between cigarette smokers and nonsmokers.

(3) In the years 1916 to 1920 inclusive, the average annual number of deaths from lung cancer of men aged forty-five to sixty-four in England and Wales was one hundred forty-six. This gives a rate of four to five deaths per 100,000 men/year for both smokers and nonsmokers combined, in contrast to today's figure of ten and thirteen deaths from lung cancer among British and American nonsmokers respectively.[4] This is surely remarkable, in view of the fact that the consumption of tobacco was about as great, and the consumption of cigarettes alone over half of the present figure,[1] at that time. Many explanations are possible, but the simplest is that there are more carcinogens in the atmosphere today than then.

(4) Cigarette smoking in this country became significant by about the year 1900, and by 1920 had risen to about sixty per cent of its present level.[1] In the years 1916-1920 lung cancer was insignificant, and the rate of increase was relatively slow until at least 1925.[7] Even granting that we are considering a long-term effect, twenty-five years seems too long before any significant effect is shown. If the average incubation period is in the order of twenty-five years, susceptible people would probably fall victim in a far shorter period, say five years. If it is agreed that the incubation period must be even longer, there is still the fact that pipes were popular long before 1900, and indeed, in 1890 the level of smoking of all types was about sixty per cent of its present figure. If tobacco alone is responsible for the increase, we would expect to find a far higher level of lung cancer in the early years of this century.

These appear to be the main anomalies which require explanation, and which it is contended are consistent with the existence of some major unknown factor related to, but not essential to, smoking. This is the central theme, and although two examples of suitable habits will be discussed, the discussion is speculative.

The first possibility is the use of cigarette lighters. A high proportion of cigarette smokers use these, pipe smokers far less frequently, and dedicated cigar smokers, never. Very few people inhale the first puff on lighting up, but they might very well inhale the gases escaping from the flame directly through their noses.

Since it is inconceivable that lighter fuel would be allowed to contain carcinogens, these, if present, must be formed by the heat of the flame. There is evidence that this could happen. The causative agents of some forms of cancer have been found to be tar, tar products, and mineral oils, in particular the unsaturated fractions.[8] Thermal cracking of petroleum fractions at temperatures up to 1000°F is a well-established technique, and in addition to producing light fractions, has been shown to produce olefin acetylene and aromatics. It could well be that active and powerful carcinogens are produced by cracking in the lighter flame, and furthermore, these could be relatively unstable as a life of as little as one second would allow them to reach the lungs.

This possibility is also compatible with a general increase in lung cancer caused by increased use of internal combustion engines.

The figure shows a plot of deaths certified as due to lung cancer among men aged forty-five to sixty-four, the consumption of cigarette tobacco and the value and numbers of cigarette lighters sold, all on the same time scale.

The sales of cigarette lighters are not a very good guide, as these are durable goods, the sale of fuel or flints would be far better. However, it does appear that there could be a correlation between use of cigarette lighters and the incidence of lung cancer.

It may seem unlikely that an act which occupies such a small part of the total time spent in smoking could be responsible for a large part of the increase in lung cancer, but there are parallels. For example, in slate quarrying the men who split the slate—a comparatively clean job—are more liable to silicosis than those who quarry it or those who saw it, both of which are rather dusty jobs. The second possibility lies in the habit smokers have of holding cigarettes, pipe, etcetera, in their mouths all the time. This habit is probably most prevalent among cigarette smokers. It is posible that reactive and carcinogenic compounds are formed in the glowing tip, and if the cigarette is held in the mouth, some of these will be inhaled directly through the nose without having a chance to react with the tobacco. This mechanism could explain the differences between cigarette, pipe and cigar smoking, and also why inhaling in the normal way appears to be relatively unimportant. It would not, however, explain the general increase in lung cancer, or why the effect of cigarette smoking was so long in appearing.

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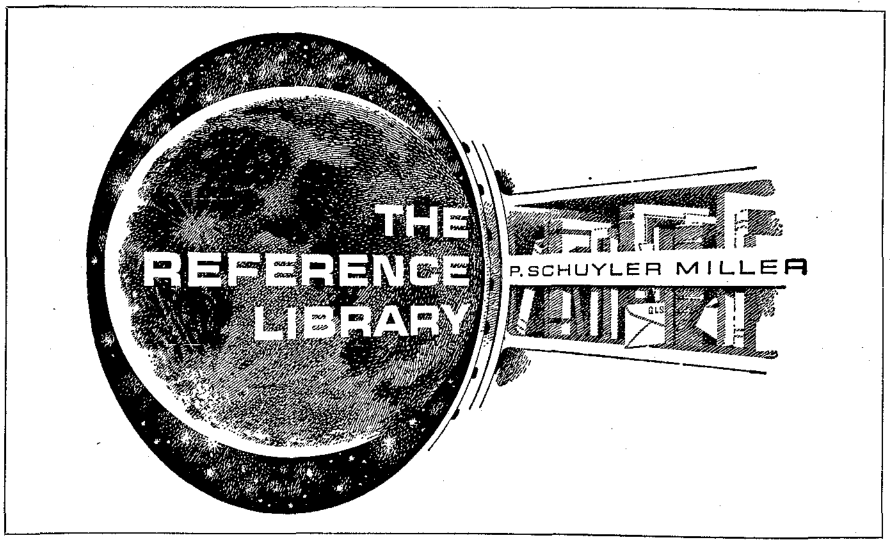

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P. SCHUYLER MILLER

OUTSIDERS

Every form of literature soon develops its own special forms and discipline. These are well understood by "insiders," who grew up with the genre and in many cases helped formulate the rules of the game. They are generally not understood or even recognized by "outsiders," who may not have any idea that the special field even exists.

Just as there are doubtless thousands of spontaneous poets and "general" fiction writers, so there are many such writers, some new, some experienced novelists, who turn now and then to science-fiction themes. More often than not they make themselves ridiculous in our eyes, as might a writer who tried a "classic" puzzle-mystery without even having read any. On the other hand, there are the books like "Brave New World" and "1984" which we are quick and happy to welcome into the fold. Three books which came along in the latter part of 1963 show how a good mainstream writer handles one of "our" themes.

Anthony Burgess, the young English novelist, should be no stranger to you if you read his *tour de force* of future juvenile delinquency in a decadent society, "A Clockwork Orange." If you skipped the hardback, there is now a paperback edition (W. W. Norton & Co., No. N-224; 95 cents) with an added study of Burgess and his work by the critic of the English *The New Leader*, Stanley Edgar Hyman, and a glossary of the synthetic teen-age jargon, "nadsat," in which the book is written. As I suspected, nadsat has a Russian base—which suggests that in the grim future it describes England has either been swallowed up by the Soviet monster, or the younger generation has adopted Russia as its pattern.

Burgess' new book, "The Wanting Seed" (Norton, 1963; 285 pp.; $3.95) is also discussed by Mr. Hyman, since the English edition came out in 1962. This is a less difficult book than "A Clockwork Orange," but more openly horrible in its picture of the social and personal brutalities of a far future in which the population explosion has swallowed up every last bit of elbow-room on Earth. The story carries its rather unpleasant hero and his wife through an overturn in the society of human superabundance. It begins in the last phases of a "Pelagian" era in which food is synthetic, teeth atavistic, procreation prohibited or rationed, and homosexuality promoted as means of keeping an ill-fitting lid on the population pressure. It ends in the fantasmagoria of cannibalism and fertility cults that ushers in an "Augustinian" phase, where mankind is his own food supply and war has replaced contraceptives.

The schoolmaster, Tritstram Foxe, and his careless wife, Beatrice-Joanna, are by no means easy characters to identify with. The thoroughly nasty young hoodlum of "Orange" makes a more sympathetic hero. But the author has ruthlessly developed his portrait and philosophy of the overcrowded society along lines that are familiar from many "real" science-fiction stories and books, with a savage realism and lack of inhibition that is not one of the "house rules" of our genre.

From France, novelist Pierre Boulle, author of "The Bridge Over the River Kwai," has sent us "The Planet of the Apes" (Vanguard Press, 1963; 246 pp.; $4.50). Here is another familiar theme—Sprague de Camp used it in our "Genus Homo" some twenty-five years ago—handled by an "outside" author, right down to an unsurprising twist at the end. It is also in the classic tradition of the extraordinary voyage, which Jules Verne tamed. Its narrator, Ulysse Merou, is one of an expedition to a planet of Betelgeuse. There he finds that men are beautiful but mindless beasts, while civilization is in the hands of the great apes—gorillas as politicians and administrators, orangutans as orthodox scientists, chimpanzees as innovators. Ulysse is sent to a laboratory for testing, persuades his captors of his "simian" intelligence, wins status in the ape society, and helps foment a revolution. The point of the book, of course, is its satiric counterplay of human and simian traits in the inverted society, with less of the "walk through the woods" that we put into "Genus Homo," and a gentler and perhaps subtler mocking of human foibles.

For still deeper subtlety in another modern variant of a classic SF form—the discursive dissertation on an imaginary utopia—try "Sedge" by Louis J. Halle, authority on international affairs. (Frederic A. Praeger, 1963; 118 pp.; $3.50). Sedge is a self-sufficient principality which has cut itself off from the world for centuries. The book's narrator has been given the opportunity to live there for a while, studying the strange society in which "big" equals "bad" and learning what the United States looks like in Sedgian eyes. In almost every paragraph there is a gentle yet telling thrust at some aspect of our crowded, nervous, standardized world, whereas Sedge emerges as pastoral, relaxed and gentle—yet bland and dull. For Halle's satire is deeper and truer, if more ostensibly direct, than that of either of the other two writers mentioned here. "The Wanting Seed" and "The Planet of the Apes" could have been written by science-fiction "insiders," though I doubt that they would have been published by any present SF magazine. "Sedge" is something else again—"Erewhon" or "Looking Backward" brought down to our time in a telling little parable. It is timeless—and true.

WATCHERS OF THE SKIES

By Willy Ley • Viking Press, New York • 1963 • 528 pp. • $8.50

There has been an over-supply of histories of astronomy in the last year or so. Most of them have been satisfactory enough as reference books, but hardly anything you would care to read. Needless to say, this "informal history" is different.

The same special talents that Willy Ley put into his classic history of rockets and rocket-movers—a new edition of "Rockets, Missiles and Space Travel" is long overdue—have been used to good effect in tracing the evolution of the science of astronomy, from the days of Hammurabi to the present. It is the book's greatest value that this process is shown as one of evolution, concept building on concept, each growing out of the culture of its place and time. Astronomy is still probably the most international of sciences, and that pattern was established very early, and has been essential to its development through the centuries.

One important aspect of astronomy —the one most science-fiction readers are likely to consider the most important, and certainly the most dramatic—is deliberately omitted. This is the question of cosmogony, the origins and mechanism of the universe. As the author points out in his foreword, this whole area has taken on aspects of a philosophical rather than a scientific problem: moreover, it has a history of its own, even more ramified and complex than that of astronomy, which has generally come back to the phenomena from time to time.

Willy Ley is now Professor of Science at Fairleigh Dickinson University. I don't know what he teaches, but his courses cannot help but be unique. Or it may be that American teachers and writers lack a deeply engrained Old World ability to see things as a whole, in four dimensions—as, for example, V. Gordon Childe saw the field of archeology. Men and events come to the fore, make their contribution and withdraw, but "the business of knowledge" grows, strengthens, consolidates itself and sends out exploratory tendrils. Books like this make the process visible.

THE LAWS OF PHYSICS

By Milton A. Rothman • Basic Books, Inc., New York • 1963 • 254 pp. • $4.95

Old-timers in science-fiction fandom, especially those in Philadelphia, know Milton Rothman as one of the real "first fans". He sold a few stories once, as "Lee Gregor." Physicists, on the other hand, know that he is one of them, engaged in plasma research at Princeton. Here, in his first popular book on science, he has done a noteworthy job of spelling out the rationale of the fundamental laws of mechanics, fields, relativity, and quantum and wave mechanics. It is the kind of book you would expect George Gamow to write, though without Gamow's quirks of insight.

"The Laws of Physics" is not a textbook, but it is the kind of book that teachers should certainly read and students in introductory physics courses would do well to read at the end of the course, as a help to learning what they are supposed to have learned. It makes, incidentally, an important point that is also made in Willy Ley's new history of astronomy, "Watchers of the Skies"—that science is concerned with *what* happens in the universe, and *how* it happens. Why it happens as it does is a philosophical question, which it may never be possible to answer. True, answers to the question "how?" have often answered the "why?" of an earlier era—but on the whole it is science fiction, not science, which is concerned with both science and its philosophy.

I wish I'd had a book like this thirty years ago. Of course, there couldn't have *been* such a book then—much of the information in it didn't exist.

ANALOG 2

Edited by John W. Campbell • Doubleday & Co., Inc., Garden City, N. Y. • 1964 • 275 pp. • $4.50

It's taken a while, but Analog at last seems to be in the Doubleday anthology circuit, and a good thing, too. Here are eight good stories and a meaty introduction by your favorite editor, the stories dating from 1962 and 1963. Compare this with, say, the eight in the reissue of "The Astounding Science Fiction Anthology," the Berkeley paperback whose stories by big-name writers date from the 1940s, and see how science fiction has changed. New names . . . new themes . . . new attitudes. Astounding SF has evolved into Analog SF in twenty years.

I don't think there's a potential "classic" in the new lot, though, unless it's "The Circuit Riders," a first story by former Pittsburgher R. C. Fitzpatrick. This is an almost documentary story about police procedure in a future Pittsburgh, in which the emotions of the populace are monitored in order to prevent crime. To answer a comment of John's in his introduction, I doubt that many cities would give the citizenry a chance to vote on the use or nonuse of the de Angelis boards, unless someone were to stir up a fuss like that over fluoridation.

The most interesting extrapolation is Theodore L. Thomas' "The Weather Man," a "typical Analog story" that combines technical vision with insight into the human and political problems of planet-wide weather control. We'd have been on Mars by now, but for politics—though there might never have been a satellite in space without 'em.

The best story, and the longest, is John T. Phillifent's "Ethical Quotient." Its hero, declared an "Ethical Absolute" to his own amazement, becomes one of a five-man panel which must decide whether a new race is to be admitted to fellowship in the Galactic Federation. Some highly unethical behavior makes him put his peculiarly human talents to use, to good advantage.

James H. Schmitz has a special talent for bringing non-human races to warm life, and he does so in "Novice"—a story that with a little cobbling might be fitted into the kind of galactic society that Phillifent described. Schmitz is *not* Cordwainer Smith, but they have their similarities.

Allen Kim Lang's "Blind Man's Lantern" is still a third story underlining the truism that societies carry their own values. An Amish farmer goes to teach effective agriculture to the African colonists of a distant star-world.

The rest are minor entertainments. Mack Reynolds' "Good Indian" is a blown-up gag. William Lee's "Junior Achievement" carries some of the breathless feeling that you get when you find yourself among really brilliant kids. And Christopher Anvil's "Philosopher's Stone" offers a new twist to the relativistic time paradox.

Of course, you should have read them all here, not long ago.

FIFTH PLANET

By Fred Hoyle & Geoffrey Hoyle • Harper & Row, New York • 1963 • 218 pp. • $3.50.

I did not try to stuff this book into the column on "outside" science-fiction novels because Fred Hoyle makes no bones about intending to write SF. This one, done in collaboration with his son, is his fourth such book and one of his best. Unexpectedly, after the hocus-pocus of his "A for Andromeda," it is to a degree a "hard"-type story which might even stir some interest in Hal Clement, chief sculptor of that form among us.

Fred Hoyle, popularizer and spokesman of the "steady-state universe" school of cosmologists, is certainly well equipped to make the technical side of a trip to another star sound plausible, and what is found there interesting. This he does, then neatly converting travel-adventure to mystery and tying it all together with a kind of field theory of time and consciousness, which he discusses in an introduction.

In 2087 Britain is trying to act as a neutral balance-wheel between the Communist and Euro-American blocs. A fast-moving star is approaching the solar system, and it seems feasible to visit it and explore its planets, one of which seems much like Earth. Russia and the West send rival ships out, the Soviet ship with a glamorous cosmonautess aboard; events, however, make the two crews join forces and experience some extremely strange phenomena together on "Achilles," the grass-grown, seemingly uninhabited world. They return, politics and opportunism stir up new tensions, and the final war starts—or does it?

In the last third of the book the Hoyles are needling both factions in the Cold War. In the first half they are having fun with the technical problems of interstellar flight. They have built the answer to their mystery around an interesting theory. But, as fiction, the book still rates second to the relatively tame "Ossian's Ride"—a far better story.

THE FURY FROM EARTH

By Dean McLaughlin • Pyramid Books, New York • No. F-923 • 192 pp. • 40¢

Dean McLaughlin really got his teeth into this one. He has projected the ethical and philosophical worries of our own nuclear scientists into a future in which Mars and Venus have been colonized and are being ruthlessly exploited by Big Earth Business. That is, after all, how and why colonies are formed. Finally the colonists, Venus in particular, have built up strength enough to revolt against their dependent, second-class status.

This would be enough for a good action story with some comments on history. Dr. Miles J. Breuer, as I recall, refought the American Revolution on the Moon in an old *Amazing Quarterly*. But McLaughlin has embedded in it another and deeper conflict—the struggle that goes on in the scientist whose discovery makes a super-weapon possible, and who knows that he has no control over how that weapon will be used.

Alex Frost is a Venus-born scientist who has had the rare opportunity of studying for several years in one of the best universities on Earth. Returning just as the war of Liberation breaks out, he must remain on Venus but refuses to use his knowledge to make weapons. Then Earth unleashes an "impossible" new weapon—projectiles traveling several times faster than light, that pass through all possible defenses and shake the planet to its core. Back on Earth as a spy, he decides that his old teacher, father of a girl who has borne his son, must be heading the secret-weapon project. So he must join the assault on the hidden base on the Moon, force his mentor and father-in-law to give up his secrets, and fend off the ruthless vengeance of the Venus authorities.

PASSPORT TO ETERNITY

By J. G. Ballard • Berkley Books, New York • No. F-823 • 1963 • 160 pp. 50¢

Any story by this talented British writer is stamped with a nightmare quality that is unmistakable. He has the bizarre point of view of the early Ray Bradbury, and a kind of poetry of style to match, but he rarely if ever lets the style get in the way of the story.

Five of the nine stories are not science fiction. "Track 12" and "The Man on the 99th Floor" are nasty little murder bits—murder by hi-fi and by posthypnotic suggestion, respectively. "A Question of Re-entry" is an ironic adventure story of the kind we used to find in *Argosy* and *Adventure* thirty years and more ago—the search for an astronaut who has come down in the territory of a rather strange

Amazonian tribe. "The Watch-Towers" is a haunting fantasy in which invisible observers seem to control the life of a village from the towers that hang out of the sky—or down from a roof? "Escapement" is a fantastic pattern-dance in time, with figures repeating and dissolving by some weird logic.

On the science-fiction side, "Thirteen to Centaurus" is the story of a simulator to end all simulators, in which generations succeed generations in a sealed "ship," under the illusion that they are Man's first emissaries to another star. "The Thousand Dreams of Stellavista" is another of Ballard's stories about the very strange community of Vermilion Sands, this time seemingly on Earth or a world very like it, where abandoned psychotropic houses are still stirred by the emotions of their long-gone owners. "The Cage of Sand" just might be a story of the origin of Vermilion Sands, told decades or generations before the others; its little colony of self-haunted people live in the ruins of Canaveral and Cocoa Beach, swallowed up by the red Martian sands brought back as ballast. Finally, the title story is a bizarre comedy of the future rich trying to find a new vacation sensation.

A TRACE OF MEMORY

By Keith Laumer • Berkley Books, New York • No. F- 780 • 174 pp. • 50¢

Anything less like the tongue-in-cheek impudence of the author's "Retief" stories would be hard to imagine. Here is free-swinging space-and-time adventure with galactic intrigue thrown in just to keep the pot boiling—sort of like a handful of sodium peroxide in a kettle of soup.

The hero, Legion, is down on his luck in a small southern town when he meets a very strange old gentleman who has troubles of his own. One of these troubles is that he is being hunted by weird and potent light-creatures; another is that he may suddenly go through a rebirth that will strip away the years—and his memory with them. "Foster" hires Legion to help him reconstruct his past, with the help of a peculiar diary.

The chase leads first to Stonehenge, and a battle with the fiery Hunters—then to the distant world of Vallon, where Foster has disappeared and Legion has to carry on his quest through the entanglements of the corrupt and intricate Vallonian society. Anything you could want is in here somewhere, and the author makes it fun.

SECRET UNDER ANTARCTICA

By Gordon R. Dickson • Holt, Rinehart & Winston, New York • 1963 • 139 pp. • $3.25

MIKE MARS, SOUTH POLE SPACEMAN

By Donald A. Wollheim

MIKE MARS AND THE MYSTERY SATELLITE

By Donald A. Wollheim • Doubleday & Co., Garden City, N. Y. • 1963 • 190 pp. • $1.25

These juvenile science-fiction yarns are for a younger set than we ordinarily note here. Gordon Dickson's sequel to "Secret Under the Sea" is tagged for the eight to twelve-year-old range and Donald Wollheim's pseudo-documentary series is for youngsters up to fourteen.

"Secret Under Antarctica" is another adventure of thirteen-year-old Robby Hoenig from the previous book, whose biologist father is now studying whales in a submarine laboratory off the Antarctic Continent. There is sabotage of the project, Robby is kidnapped by a would-be dictator who wants to reverse the wanderings of the continents, his old friends, the international agent Lillibulero shows up, and Robby makes a new animal friend in a huge sea leopard. Gordon Dickson knows how to liven a lively adventure yarn with novel twists and legitimate scientific speculation.

Donald Wollheim's "Mike Mars" series, about a mythical parallel group of young astronauts, is on the literary level of the Tom Swift stories of my—and his—youth, but they have a unique realism that makes them stand out. The author has had the co-operation of the Space Services in making his backgrounds and situations authentic, and it sets his series apart. In these two books a new cycle starts with the introduction of a new villain, a Russian cosmonaut who has discovered the secret U. S. space program and is out to stop it. In "South Pole Spaceman" he is trying to capture the X-15 that Captain Michael Alfred Robert Samson—"Mike MARS"—is using to launch a rocket from the South Pole. In "Mystery Satellite," Russia has put an armed automatic satellite into orbit and Mike goes up to investigate, meeting Arkady Kosmodin in a battle in space. In the first books of the series the villains were personal or domestic; this new, if traditional, twist may be intended to sustain interest as Mike Mars gets so far ahead of our space program that Donald Wollheim has to fall back on his experienced imagination.

BUDRYS' INFERNO

By Algis Budrys • Berkley Books, New York • No. F-799 • 1963 • 160 pp. 50¢

There are nine stories in this collection—two of them, "Silent Brother" and "The Peasant Girl," published here in what was then Astounding Science Fiction, back in 1956. Although the author says in his introduction that he considers them representative of his writing career from 1952 to the present, none is more recent than 1958. They were all written, he says, purely as "intelligent entertainment"—if any of them are more than that, it is because the reader as well as the writer has brought more to them. And *that* is a point I wish I had had sense to make long, long ago.

"Silent Brother," as you may recall, is the story of strange things that happen to a crippled spaceman after the first ship gets back from another star. It is a masterful bit of intelligent entertainment. "The Peasant Girl," which closes the book, is a very human little story about a distasteful future whose theme, if my high school French permits a paraphrase, is "plus l'Homme change, le plus c'est la meme chose."

"Between the Dark and the Daylight," which the author offers as a variation on a theme by Damon Knight, is one that should set anyone's teeth on edge. The survivors of a human expedition, sealed into an armored dome on an utterly hostile world, have been doggedly breeding their race into beings viciously strong enough to make their way in the hell outside.

"And Then She Found Him . . ."—a gently bitter story of the loneliness of those with psi talents. "The Skirmisher" is one about a man with other strange and nasty talents. "The Man Who Tasted Ashes"—which the author considers representative of his present work—is an almost "straight" story about a man working as a double agent for extraterrestrial meddlers, with a twist of irony instead of an olive.

"Lower Than Angels" is, I think, my favorite. Its hero, hired by a company that is ruthlessly engaged in "educating" the races of space to accept the bounties of trade, finds his conscience and his job disturbed by a people who consider him a god. "Contact Between Equals" plays with the question of who are equals, and for what reasons. And, finally, there is "Dream of Victory," which goes inside the mind and body of an android who cannot bear his subtle separation from the world of "real" humans.

Maybe we're short of the "hard" technical science fiction of the early years, but books like this and Ballard's "Passport to Eternity" show how rich and varied the field has become.

THE COLORS OF SPACE

By Marion Zimmer Bradley • Monarch Books, Derby, Conn. • No. 368 • 1963 • 124 pp. • 35¢

Ignore the cover illustration, which is exceedingly juvenile and has nothing to do with the story, and try this double "first"—Monarch's first juvenile SF paperback, and as far as I know Marion Bradley's first juvenile. It's one of those that needn't have been tagged, except that today's heroes seem to be about twenty years older than they used to be. (Has science fiction become a middle-aged daydream?)

In this particuar intergalactic future the nonhuman, though humanoid, Lhari are monopolists of warp-flight among the stars. Some of the human races strewn among the stars have adjusted to the situation—the Mentorians, for example. Others are fighting, probing and spying to learn the Lharis' secret. Young Bart Steele has the blood of both stocks in his veins—Vegan and Mentorian—and before many pages have been turned he is up to his neck in a plot against the Lhari, disguised and running for his life, his father dead. To carry on the cause of human emancipation from the Lhari monopoly, he allows himself to be surgically transformed into one of the gray-skinned "monsters"—and then the fun begins.

Marion Bradley handles action smoothly and convincingly, her characters come to life, and there is a lesson in the way things work out. Old-fashioned? Maybe.

THE SHIP FROM OUTSIDE

By A. Bertram Chandler

BEYOND THE GALACTIC RIM

By A. Bertram Chandler • Ace books, New York • No. F-237 • 1963 • 108 + 114 pp. • 40¢

The author of these stories of the Rim Worlds—that region on the outer fringe of the Galaxy, where there is only empty space in the night sky after the great glow of the Lens has set—is Chief Officer of an Australian coastal steamer. When he gets across the loneliness of the great, empty wastes he is very, very good. These stories, though, are just routine yarns that nibble at the possibilities of the Rim.

"Beyond the Galactic Rim" is a composite title for four short stories published in various SF magazines about five years ago. On the whole, they are gimmick stories, although the gimmick is one of the peculiarities of the Rim Worlds. In "Forbidden Planet" the owners of a ship too good for the Rim manage to find a use for it, on a thoroughly repulsive world that only a scientist would want to visit. "Wet Paint" offers the tricky little puzzle of cave paintings that are still wet. "The Man Who Could Not Stop" is a crook who comes up against the highly pragmatic local laws of the Rim. And "The Key"—well, it's the key to the meaning of the universe, and a very strange one, too. The immediate problem is the source of the streams of raw hydrogen from which stars and galaxies are made.

"The Ship from Outside" is another of the adventures of Derek Calver, this time trying to explore beyond the rim—yep, it should have had the title of the other half of the book—in search of a ship from another galaxy. He again comes up against the wiles of that Mata Hari of the Rim, Sonya Verrill, and Calver's wife is not amused. I wonder whether Australian Chief Officers have these problems, too?

MORE REPRINTS

SKYLARK OF VALERON

By Edward E. Smith, Ph.D. • Pyramid Books, New York • No. F-948 • 1963 • 206 pp. • 40¢

Third and last of the classics of the 1930s which signaled the "breakthrough" that John Campbell described at the Washington convention. "Skylark of Space" is Pyramid F-764 and "Skylark Three" is F-924. They're dated, yes—but you ain't read science fiction till you've read the "Skylark" yarns.

THE SEARCH FOR ZEI

By L. Sprague de Camp

THE HAND OF ZEI

By L. Sprague de Camp • Ace Books, New York • No. F-249 • 1963 • 143 + 113 pp. • 40¢

When this adventure yarn was published here in 1950-'51 it was called "The Hand of Zei." Then it was expanded a bit, and Avalon converted it into *two* books. Now Ace has brought them back together—and the second part is reabridged. It's no world-beater: just very good fun, civilized in a barbaric sort of way, and certainly a bargain at this price, whittled or not.

THE REFERENCE LIBRARY

PILGRIMAGE: THE BOOK OF THE PEOPLE

By Zenna Henderson • Avon Books, New York • No. G-1185 • 1963 • 255 pp. • 50¢

You may have missed the stories about The People if you don't read *Fantasy & Science Fiction* and missed the 1961 hardcover edition. Galactic migrants, wrecked and scattered on Earth, they have struggled to submerge their difference and find a place among men—but those differences crop out. A continuity helps to minimize the sameness of the episodes, and the author's profession—a grade-school teacher—fairly bursts out between the lines. You should certainly read it if you haven't.

LIMBO

By Bernard Wolfe • Ace Books, New York • No. A-3 • 1963 • 413 pp. • 75¢

Nobody realized it in 1952, when the hardcover appeared, but this was intended as a parody of science- fiction stereotypes. It was taken as "straight," impressive and highly controversial. Neuroses and psychoses run wild in this picture of 1990, when the sex cult of the willful cripples is in vogue.

LORD OF THUNDER

By Andre Norton • Ace Books, New York • No. F-243 • 1963 • 174 pp. • 40¢

Inimitable far-world adventure, and a sequel to "The Beast Master." Hosteen Storm, far from home, probes a mystery in the back country of Arzor.

THE ASTOUNDING SCIENCE FICTION ANTHOLOGY

Edited by John W. Campbell • Berkley Books, New York • No. F-875 • 1964 • 192 pp. •50¢

Reissue of the 1956 paperback, with eight out of the twenty-three stories in the original hardback anthology. They're by Asimov, Leinster, Simak, van Vogt, Padgett, Neville, del Rey, and John Pierce; vintage, 1940's—the "great age of SF".

THE PERFECT PLANET

By Evelyn E. Smith • Lancer Books, New York • No. 72-679 • 1963 • 144 pp. • 50¢

First paperback from the 1962 Avalon edition of the story of Artemis, the planet dedicated to The Body Healthy and Occasionally Beautiful. Lots of fun.

A FIGHTING MAN OF MARS

By Edgar Rice Burroughs • Ballantine Books, New York • No. U-2037 • 1963 • 192 pp. 50¢

Every reprint list begins with Burroughs these days. With this title, the seventh in the Martian series, Ballantine closes the chronicles of Barsoom and will presumably settle down to finishing off Tarzan. Rumor saith not whether they will have any other Burroughs titles.

LAND OF TERROR

By Edgar Rice Burroughs • Ace Books, New York • No. F-256 • 175 pp. • 40¢

Ace, I'm told, has the paperback rights to the entire Pellucidar and Venus series. This is the fifth in the former lot; I described it not long ago, when Canaveral Press brought out the new hardback reprint. Good symbolic cover by Frank Frazetta.

AFTER WORLDS COLLIDE

By Philip Wylie & Edwin Balmer • Paperback Library, New York • No. 52-225 • 1963 • 190 pp. • 50¢

Read Chapter 17 of Sam Moskowitz' "Explorers of the Infinite" for the reason why this great early interplanetary adventure series was never completed. This is the second part; read Paperback No. 52-180, "When Worlds Collide," first. Wylie is alive and famous; Balmer is dead and forgotten by all but senior citizens; so Wylie now gets first billing.

TRIUMPH

By Philip Wylie • Crest Books, New York • No. R-675 • 1964 • 240 pp. 60¢

This, the publisher indicates, went through six hardback printings in 1962 and 1963. This is today's Wylie, with a worldwide search for survivors of an atomic war.

ALIEN PLANET

By Fletcher Pratt • Ace Books, New York • No. F-257 • 188pp. 40¢

This is 1932 Pratt—maybe no more feeble than most of the original SF of that day, but feeble for Pratt.

STARSHIP TROOPERS

By Robert A. Heinlein • Signet Books, New York • No. D-2381 • 1963 • 208 pp. • 50¢

Reissue of another "Hugo" winner. The book originally came out in 1959, and received its award at the Pittsburgh convention; the paperback was out in 1961, first time 'round.

MAN OF TWO WORLDS

By Raymond F. Jones • Pyramid Books, New York • No. F-941 • 1963 • 268 pp. 40¢

A new title for a venerable classic—it was originally "Renaissance," when Gnome Press published the hardback edition in 1951, and when the serial version was in Astounding back in 1944.

RAIDERS FROM THE RINGS

By Alan E. Nourse • Pyramid Books, New York • No. F-933 • 1963 • 160 pp. • 40¢

Paperback edition of a good 1962 juvenile which isn't quite in the Heinlein-Norton league, but is far better than much adult fare.

NOTE TO BOOKHUNTERS:

At the Washington convention, several readers complained that paperback publishers keep their money and ignore their orders when they order books by mail. We're not here to promote specific stores at the expense of others, but Claude Saxon Jr. of Paris, Tennessee, reports that *Consumer Report* has suggested The Bookcase, Inc., 651 Lexington Avenue, New York 22, N.Y. as a source of any paperback in print. They charge fifteen cents a book extra on orders of less than $3.00—about six books at current prices—but nothing extra for orders over $3.00. I have not tried them myself, but I may have to if local distributors grow more shiftless.

brass tacks

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space (Astrologers have noticed it coincides with large-scale illness, massive hospitalization and epidemic disease) the influence is quite obvious. This is merely a cursory glance at the aspects. No charts have been set up and no detailed interpretations are in the works.

This appears to be a more severe epidemic than the influenza outbreak which reached a peak on February 19, 1963 and reported in Analog months in advance. In that one, two hundred fifty people—perhaps more—died in New York City alone. It spread to twenty-one states. This time, I feel *the virus will not be identified* by medical authorities.

Since my interest is in seeing that something be done about these warnings, I'm willing to co-operate fully, but only with sincere individuals who want to take some concrete action in the matter.

February 4th to 14th, at this writing, seems to be the worst period and may be the peak.

JOSEPH F. GOODAVAGE

143-20 37th Avenue
Flushing 54, New York

Analog isn't a news magazine; it takes months to get from editor's desk to your newsstand. This letter was received December 4, 1963. It'll be long past February 14, 1964 before you get this. How did his prediction make out?

Dear Mr. Campbell:

I must protest at several assertions made in the December Brass Tacks by John P. Fairfax.

No formula in any system of Logic can make the existence of a doorbell buzzer impossible; logical formulas are not assertions about the existence of doorbell buzzers or of any other object. In fact, there is some question as to whether logical formulas are assertions "about" anything at all; they may be instead formal linear designs written on paper subject to certain "aesthetic" values, or they may be stylized diagrams representing certain structural features of certain linguistic habits exhibited by a certain class of people in a certain civilization. In any case, let the doorbell buzzers and spark coils exist or not as they like: a system of logic couldn't care less.

We can say, though, that a buzzer or similar device is, structurally speaking, an *electrical model* of the logical formula $p <\!-\!> \backsim p$ whose truth value is False in Propositional Logic. Note that there is no difficulty or contradiction involved in the *existence* of a device which *structurally represents* a false statement. Logical *Falsity* is a matter of logical *structure* not of *existence;* a logically false statement can certainly *exist* and so can any number of representations, diagrams, and models of it.

Interestingly enough, the buzzer-type of circuit is useful precisely because it involves an aspect of reality that is never explicitly involved in any system of logic: Time. The buzzer requires *time* to carry out the implication: $p -\!> \backsim p$ ("if you're on, turn off") and the other half of the cycle: $\backsim p -\!> p$ ("if you're off, turn on"). It is this *delay* in obeying the two steps of its built-in program which produces a sustained oscillation.

Don't be fooled by the spurious argument which runs: *If* electrical (or mechanical) components existed that could change their state *instantaneously,* responding to infinitely speedy electrical currents, *then* a buzzer could not exist since it would have to be in both states, on and off, at the same time. Under the given hypothesis such a buzzer *could* exist, of course, because the ability to respond instantaneously to infinitely speedy signals is precisely the ability to be in two mutually exclusive states at the same time.

DON MARK SEGAL

4401 Walnut Street,
Philadelphia, Pennsylvania 19104

In other words, any similarity between a logical statement and reality is purely coincidence!

Dear John:

This latest effusion is inspired by the letter of Mr. N. K. Johnson, in the November issue of Analog. I had brought up the really pressing and immediate problem of technological unemployment, and the problem of what to do with the superfluous. Mr. Johnson wrote that the problem had been explored in depth by the Technocracy movement.

Of this I am, of course, well aware. I was extremely interested in the movement at the time, as a lot of people were, and was, and still am, rather in agreement with its basic postulates. However, I'm afraid that Mr. Johnson missed one point, and a rather important one, of my question.

It is theoretically possible to organize a distribution system that will get the goods and services to the people that need them, no matter how high the unemployment rate. That is essentially a technical problem, and as such, is presumably solvable by the application of intelligence.

But, you still have the problem of what to do with the superfluous character. You can feed him, house him, clothe him and more or less amuse him—the Romans managed it for a couple of centuries or more—but you have an explosive situation on your hands when a large fraction of the population *knows* that it is superfluous, and the remaining fraction is convinced that the superfluous are free-loading. A guy who knows that he has no real part in a society is likely to resent it, and the guy who is feeding him is sure to. Talk about class wars! And please don't anybody, tell me that the unemployable will take up creative pursuits! He won't. Remember Sturgeon's law? He'll sit in front of the TV, getting madder and madder.

And the guy with the job, working his head to the bone, won't be any model of sweetness and light either. He'll know that he's doing what has to be done, but he will start wondering if it is really necessary to keep the others alive. "After all, they're so stupid!"

So *this* is the really tough part of the problem. I don't claim to be a behavioral scientist—though from what I've seen of the latter's publications, I doubt that the words "behavioral" and "scientist" can legitimately be combined—but it would seem that it does not take much prescience to decide that the situation described contains explosive elements.

Any ideas, anybody?

JOHN C. CLARK

Well—I've heard ideas, but most of them are unprintable. That situation isn't a theoretical future problem; we've got it now! That's what Mack Reynolds has been writing about!

Dear Mr. Campbell:

I've just finished reading your editorial, "How to Breed a Superior Race."

The same conclusion about warfare that you consider for the species may also be made for the cultures involved.

For instance, the crusaders brought back some of the technology of the Moslems and, in reverse, the Germans were forced after World War II to build a sensible economic system to compete with the other nations.

Incidentally, consider what nations always fight against overwhelming odds—and win. Usually, these nations Germany, Israel, Finland, et cetera—are brought down by an overwhelming degree of force, and must live in poverty and constant danger.

Consider, too, the nations which have so much difficulty in overwhelming those countries. Invariably, when conquered, these nations find their systems eliminated—or go under and become small nations being fought over.

The system seems to be a sort of chain reaction, too—every war fought adds to the ability of the victorious and defeated. (But maybe not. England was the decisive power in World War I; to decide World War II it took the U.S. and Russia—with Britain shoved aside; today Britain asks if, please it could join up with the EEC—and half of Germany dominates that.)

Back to the chain reaction analogy. If this is so, then Man will—must—learn ways to kill half the planet. Since each of any two sides in a dispute believes it is more courageous, the only conclusion is that destruction is inevitable.

That is, inevitable if (1) Men don't spread out, and fight on a larger scale on a larger background; or (2) stop or reduce the scale of fighting. Since you lose talent from lack of practice—then prospect (2) involves defeat by "Out there." In warfare the best way to eliminate conflict is to eliminate an enemy; and since they who defeat us will be more bloodthirsty, conclusion (2) also involves oblivion.

Consider, finally, what is essential to the human race: Mass space travel.

If we do not develop mass space travel, we will ultimately blow our planet up; be enslaved by E-T's, or blown up; or (what is, to me, least likely) stagnate.

CHRIS JOHNSON

6535 - 95th SW
Lakewood Center, Washington
98499

The three old choices—agree, be slaves, or drop dead!

Dear Mr. Campbell:

From a number of sources I have been piecing together the idea that machines, including electronic equipment, act or behave in a way that reflects the operator in some way. Whether or not this is true, the experiment I performed is relevant to something.

The work was done on a television. At the time I began, the television needed some sort of repair work every few months. I had an idea that if I could think of it only as a working object it would work.

At the time I started it was working. It continued to work until one afternoon I decided to find out if the television continued to work through luck or if I was actually keeping it working through thought. At that time I consciously denied all attempts to control it. By 10:30 that night the set was dead.

To put it back into the same condition I had to replace:

1 fuse, 2 selenium rectifiers,
1 filter capacitor,
1 25L6 vertical output (heater-cathode short),
1 6CB6 tuner (gas),
1 power resistor (value change, 2.6K to 2.9M),
1 capacitor horizontal output 2nd grid filter (shorted),
1 capacitor vertical output 2nd grid filter (shorted).

The 25L6 short drew just enough extra current to burn out the rectifiers but not enough to blow the fuse until the rectifiers could not be saved. This should have caused a low B+, but the resistor and capacitors show the symptoms of being overloaded. I wouldn't even venture a guess on how gas suddenly got into the 6CB6.

Interesting?

MATTHIAS M. GIWER

1611 Gilsey Avenue
Cincinnati 5, Ohio.

Another Finnagle Law maybe?

Dear Mr. Campbell:

1963 has been a lousy year, one of the lousiest I recall, but I have had the pleasure of reading at least one eminently readable story this year in your magazine, to wit Johnathan Blake McKenzie's "Thin Edge." His "Anchorite," last year, was one of your best; this continues his record, yet unbroken, of thoughtful, well-written science fiction. Let's see more from this author.

Now to the gripes.

Firstly, your illustrations: Schoenherr, I know, can draw well; he doesn't, though, for some unknown reason. Why?

Letter column: dull, dry and uninteresting. The editorials, although I like them, are not the main feature of the magazine; the fiction is. Although you and your correspondents sometimes have interesting and timely things to say, I would like to see more discussion of the fiction as well as the editorials and articles.

What I want to see in the future in the way of fiction: more McKenzie, Poul Anderson, and Allen Kim Lang. The latter's "Blind man's lantern" was by all standards the best story you published last year.

JOHN BOSTON

816 South First Street,
Mayfield, Kentucky 42066

O.K. friend—then how about discussing the fiction yourself? I can't print letters I don't get!

transphonemator

continued from page 7

The major reason Newton was able to crack the great problem of Celestial Mechanics lay in his rejecting the obvious "fact" that all previous men accepted and worked from—that any moving object tends to come to rest. That's an obvious fact; everyone has seen it demonstrated a million times in daily living. And with that self-evident truth in place . . . the problem of Celestial Mechanics couldn't be solved. You had to have God not only as the Creator, but then you had to keep Him busy pushing things around so they didn't come to a stop.

Until you gave up that self-evident truth, and accepted the alternative—now known as Newton's First Law of Motion—you could not analyze the behavior of the observed planets sensibly. No matter how much effort or ingenuity was spent on it, wrong answers were built in by the false postulate.

In the same way, the problem of analyzing human voice modulation had a false postulate built into it; the great science teams of the greatest research institutes of the world labored to crack the problem, and because of the built-in wrong-postulate, they all wound up with more and more elaborate epicycles and frequency analyses.

I have seen a human speech modulation analyzer, combined with a porpoise-speech synthesizer, and a porpoise-speech analyzer combined with a human-speech synthesizer.

It's straight out of science fiction; it's what Doc Smith had his Nevians produce . . . only more complex, because it also considers, and answers, Beam Piper's problem of alien analytical methods of hearing!

The best anyone had done in that direction before was the Bell Laboratories vocoder. (Remember "Pedro the Voder" at the 1939 World's Fair?) The vocoder made a frequency distribution analysis of the input, sent signals, and activated frequency band synthesizers at the other end. It could be crammed into two six-foot relay-racks full of electronic hardware.

The analyzer-synthesizer combination I saw could be built handily into a cigarette pack. It takes only about fifteen transistors. And it's a "real time" system—it doesn't have to take in a recording, run an analysis on it, decode its analysis, and activate the synthesizer section ten seconds or minutes later. It speaks porpoisese when you speak English.

Dr. Dwight Batteau, of United Research, Inc., in Cambridge, Massachusetts developed it. To do it, the first step was to decide that if all the elaborate effort all the great labs had put into frequency analysis of speech hadn't worked, then probably the very basic postulate that frequency was important was false. Of course, it's perfectly obvious that frequencies are critically important—anyone who's worked with sound knows that.

Yes . . . and everybody knew that moving bodies naturally tended to come to rest, too. Anyone who'd observed at all knew it.

So—try the postulate that *frequency has no bearing on speech modulation whatever!*

Well, that explains why a four-year-old-girl from Georgia, U.S.A., saying "I want to go home," is just as intelligible as a forty-year-old *basso profundo* from Georgia, U.S.S.R. saying the same thing . . . even with an accent.

Frequency simply has nothing whatever to do with the matter, any more than the state of the weather does. Sure—frequencies are always present. Some kind of frequency range, anyhow. So—and some kind of weather is always present, too!

The first step in Batteau's work was to try seeing what the human hearing system *did* do—if, as he was assuming, it was *not* analyzing frequencies. Some of that work we reported here a few years ago; in the course of it he found that the *pinnae*—the external ears—of human beings are exceedingly sophisticated gadgets indeed, a great deal more than the crinkly decorations previous students of human hearing had assumed them to be. So long as the frequency-is-all-important axiom was maintained in place, the external ears *couldn't* have any useful function, except to act as pretty inefficient ear trumpets.

Dr. Batteau found that the ear, the entire hearing system, depends on an almost incredible accuracy of *time*-analysis. The analysis depends on *when,* not on *what.* The frequency (what) is of no importance; *when it arrived* is the critical datum.

Various tests he made showed that the human hearing system can distinguish time intervals of approximately two *microseconds.* That's micro-, not milli-seconds!

Now two microseconds is the period of a 500,000 cycle frequency; everybody knows perfectly well that the human ear can't hear anywhere near that high a frequency—not even a tenth of it! About one fiftieth of that, if you aren't over forty.

It is clearly impossible for human beings to distinguish any such time-interval, when they can't hear frequencies above 15,000 cycles at best.

Either it's clearly impossible they can't distinguish such time intervals . . . or that they don't listen to frequencies in the first place!

Human beings can determine the direction of origin of a sound with remarkably good accuracy. (They can also do a startlingly sophisticated job of range-finding by measuring the radius of curvature of the sound-waves arriving at those "unimportant ornaments," the pinnae.) It has long been recognized that horizontal sound-source direction is determined by comparing the time-of-arrival of a wave-front at the two ears. In view of the small angle of error human hearing is capable of, it's possible to compute the precision of time-measurement involved in even horizontal sound-source direction sensing.

Dr. Batteau showed several years ago that vertical sound-source angle is determined by using the pinnae as acoustic delay line reflectors; the complex channels of the pinnae act to put a reflected wave-pip on an arriving sound-front. Since the pinnae are assymetrical in the vertical plane, the time-placement of the reflected sound-front will vary with the vertical angle —and the auditory mechanism is capable of such precise time-discrimination that that minute difference in time-displacement is an adequate clue to determine the direction of the sound-source!

Once started down the newly opened line of analysis, more and more of the facts of human hearing, and human sound-analysis became explainable in accurate mathematical terms. (I'm no mathematician, and this is no place for the level of math involved; a full mathematical treatment of the problem has been worked up by Dr. Batteau however.)

But the thing about Dr. Batteau's research that has most fascinated me is the extremely simple, "obvious" sort of experiments and plain, ordinary observations that he has used.

Jingle keys in front of someone while he closes his eyes; he can readily point to the approximate source of the sound, both in vertical and horizontal direction. Now have him fold downward the top lobes of his ears, and try again. His horizontal angle determination is as good as ever . . . but his vertical sense is gone! Why . . . if the pinnae are the "useless ornaments" that people have thought them?

Since time is so extremely critical in human hearing-analysis, making sound-reproducing equipment suddenly offers a wholly new level of challenge! Dr. Batteau is looking for more satisfactory microphones, for instance; currently the ones he's using are adequate only from about 15 to 250,000 cycles; to match the competence of the ear, they should be flat out to at least 1,000,000 cycles!

Loud-speakers are clearly impossible —but even earphones of the requisite capability are not to be had. Nevertheless, using the 250 kilocycle microphones both as microphones and as ear-pieces—they're about ¼ inch in diameter, condenser mikes, and can be driven as electrostatic "speakers"—using specially designed amplifiers that have time-accuracy—no phase shift allowed!—to half a microsecond, Batteau has been able to demonstrate stereo sound that is *three*-dimensional, not just two! A "head"—a featureless ball set on a stand—equipped with silicone-rubber molded ears, and the high-precision mikes, connected by cable to the amplifiers and special headphones, allows you to experience three-dimensional sound, and test just how it is your ears do the major miracles they do.

Incidentally, if you're a hi-fi buff—throw away all tone controls, change-over networks, "volume compensators," and the like; they are all phase-shifting networks—and the essence of human hearing is time-measurement. Stereo very clearly is dependent on the time-difference between the two pickup points; any phase-delay or phase-acceleration network will alter the phase-relationships between the electrical wave-forms. Therefore, only an amplifier system, and reproducing system *having no phase shift whatever* can give true-to-the-ear hi-fi music!

The consequences of throwing out the assumption that frequencies were the crucial datum, and recognizing that, instead, time-analysis was the basic analytical measure, he led to a great many further developments—among them the *transphonemator*.

The gadget that translates human voice-modulation to porpoise modulation is not a mechanical translator; it doesn't help you understand what you hear. Most of us can't read even the most familiar names when they're written in Arabic, Urdu, or Hindi script; we don't know the phonetic values of those other alphabet characters. The business of setting an English name or word into another alphabet is called *transliteration*.

A sentence in Arabic probably wouldn't be a bit more meaningful to you if were transliterated into English than in its original Arabic characters—but at least you'd be able to make a stab at pronouncing it.

In effect, Batteau's device "transliterates" porpoisese speech into humanese. To read the Arabic sentence and understand it, even after it was transliterated into English characters, you'd have to learn the meaning of the Arabic words. So, even after porpoisese has been transformed into humanese, you still have to learn to understand the words—but at least they are now in a form your mind is able to perceive. The device transforms not letter-for-letter as transliteration does, but phoneme-for-phoneme. Hence it's best called a *transphonemator*.

Batteau is one of the numerous people doing research on the problem of porpoise speech; he needed a transphonemator—and had the new postulate of time-analysis to help him work it out.

What do we do when we speak that's important? What makes speech? We start by blowing air through the vocal cords; they simply make a sort of buzzing sound; that isn't speech. Speech isn't tone; the vocal cords' buzzing sound can be controlled in pitch and resonance by shaping the mouth cavity, the position of the jaws, et cetera—and it's still not speech. Listen to the opera singer running up and down the scale; there are no words, just controlled tones and pitches.

Something we do with the mouth-parts makes speech though. The interesting thing is that Dr. Batteau learned a crucial factor from Charlie McCarthy; Edgar Bergen didn't tell him!

You can speak perfectly intelligibly even if you keep your jaws clenched; anyone who's had a broken jaw wired shut can tell you that it's possible, and in a couple of weeks you get to be good at it. So it isn't jaw-movement that makes speech.

Charlie McCarthy's jaws and lips flap very conspicuously . . . but Charlie doesn't say a thing. Edgar Bergen's jaws and lips do not move visibly—and perfectly intelligible speech results.

Then speech is *not* due to shaping the mouth cavity by changing the jaws, lips, or changing pitch by altering the vocal cords.

The only thing left is the tongue. It's the tongue, then that makes speech out of the buzzing sounds produced by the vocal cords.

But now, with Batteau's new approach, we can suspect that the tongue isn't changing frequencies—the old, false postulate would have led us off down that blind alley—but is somehow doing something to time-relationships.

It is. The speaking mouth is, quite predictably, an inverse of the ear; it's a sound-source with an adjustable time-delay channel, where the ear is a sound-detector with a carefully calibrated system of time-delay analyzers. (Yours were well calibrated by the time you were three months old; your audio centers had been working on that problem day and night since shortly before birth!) The tongue, lying in the sound-channel from the vocal cords, can form a reflecting block that will alter the echo-reflections imposed on the emerging sound. The *frequency* of the sounds being echoed is of no importance whatever; the *time-delay* imposed is the crucial datum. That's why the four-year-old girl and the forty-year-old *basso profundo* get essentially the same results. More important than the absolute time-delay is the ratio of time- delay patterns, so that the absolute dimensions of the mouth-cavity are of very little importance.

Note that *any* frequency, all frequencies in fact, will be delayed by precisely the same amount if they undergo a 3-inch reflection—because the speed of sound, not the frequency, determines the delay time! The amount of phase shift, as measured in phase angle, will vary with frequency, of course—but the time-delay will be invariant.

Then if this be true, it should be possible to recognize phonemes not by some process of elaborate frequency analysis, spectrum analysis of the sound-spectrum into frequency bands, and the like—but simply by detecting time-delay patterns.

It is. That's how Dr. Batteau's transphonemator works. It recognizes human phonemes in human speech by responding to the relatively few time-delay patterns men use. For each phoneme of human speech, an arbitrary porpoise phoneme has been assigned. When the human phoneme "aw-", for example, comes along, the "aw-" recognizing channel responds, and turns on a circuit that generates one of the porpoise phonemes that have been recognized in recordings of porpoise speech.

The inverse transphonemator has porpoise-phoneme recognition channels which turn on human-phoneme generators.

The assignment of phonemes is purely arbitrary, but consistent. A certain recognizable porpoise phoneme has been connected to the "aw-" phoneme generator; in the human-to-porpoisese device, the "aw-" recognizing circuit activates a generator that produces the same porpoise phoneme.

The result is that a man can listen to the porpoise-to-human transphonemator, and hear the porpoise "saying" "awray . . . awray . . . awray . . ." and speak into the human-to-porpoise transphonemator, saying "Awray . . . awray . . . " The porpoise then hears a voice saying something in porpoisese —with a rather horrible and mechanical accent, no doubt, but recognizable as porpoisese language!

The first time Dr. Batteau tried out his transphonemators on a young — adolescent—porpoise, isolated in a pool, the porpoise had been cruising around in the pool, calling out something that transphonemated to "awray". When Batteau replied with "awray" . . . the porpoise stopped suddenly, showed every sign of startlement, and after a repetition from Batteau, suddenly started calling out something that transphonemated to "Whyo . . . whyo! . . . whyo!"

Further experiments with talking to porpoises are under way. Now that the technical problem of interspecies transphonemation has been solved, a completely different kind of experimental program has to be mapped out —one which is much more in the field of psychology than physical communication technology.

But several things about Dr. Batteau's achievement greatly interest me. Obviously, what he has done is something straight out of science fiction—the inter-species communicator gadget has actually been built! It involved exactly the problems two very sharp-thinking science-fictioners, Dr. E. E. Smith and H. Beam Piper, had recognized and laid out in specific terms—that of frequency-range difference, and that of different forms of sound-analysis.

It is also of acute interest to me, because the method of solution involved the rejection of a completely accepted false postulate currently held by all good little Scientists—that frequencies are the be-all and end-all of sound. And in doing so, Dr. Batteau demonstrated again what most of the breakthroughs of history have demonstrated—that major progress does not require a tremendous research team. It requires a mind with a new viewpoint. That much of the non-progress made in Science results from the absolute and unquestioning acceptance of some Self-Evident Truth that just happens not to be true at all.

Dr. Batteau's transphonemator will never be able to transform human speech into English language on a typewriter—but it is only one short step removed from making a Spanish-transcribing typewriter! Spanish has very nearly perfect correlation between phoneme and alphabet symbol; any device that can recognize human phonemes and transphonemate them to porpoise phonemes—can also transphonemate them to the electrical pulses of a computer, a dial telephone system, or an electric typewriter.

The original transphonemators were breadboard models—no effort at compact or commercial design was made. I'm sure that a little effort at compacting the circuit elements would yield a transphonemator from human-to-electronic language that would fit readily in the base of a standard desk telephone. And I mean fit in without displacing the necessary components now installed there!

But Bell Labs will have to give up their sine-wave frequency analysis of sound to achieve it.

The Editor

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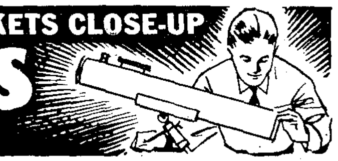

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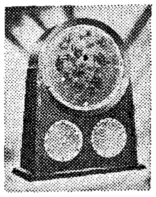

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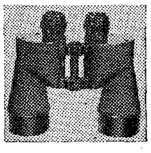

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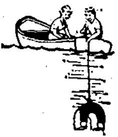

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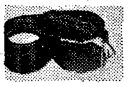

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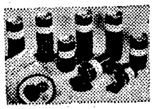

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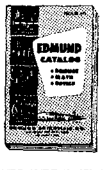

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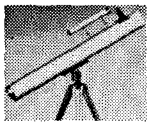

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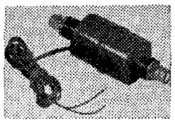

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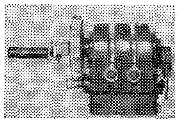

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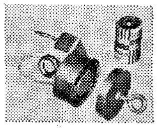

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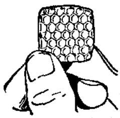

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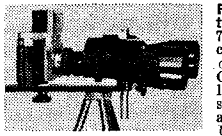

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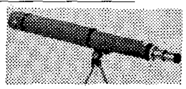

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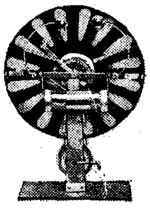

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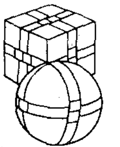

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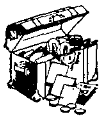

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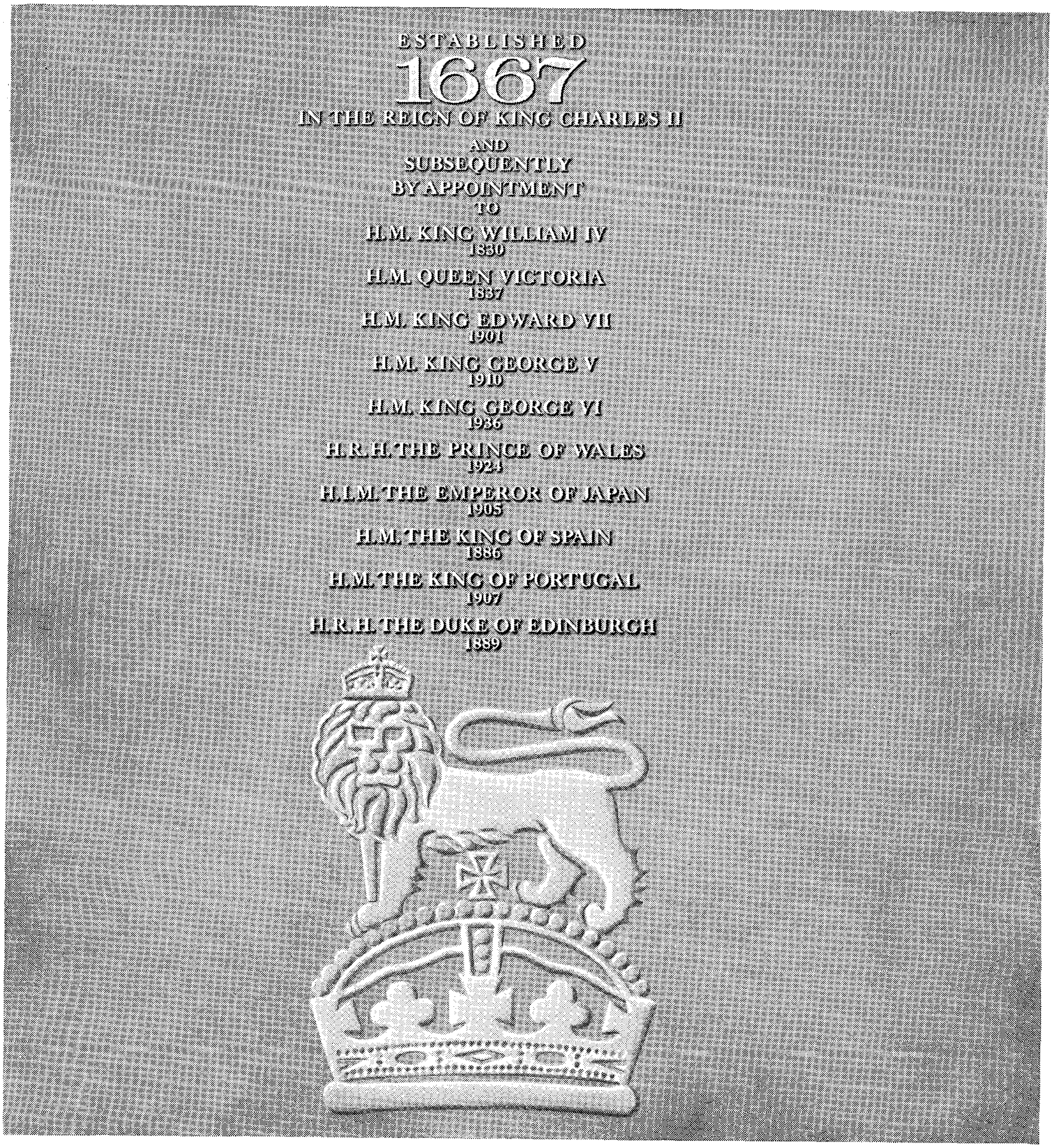
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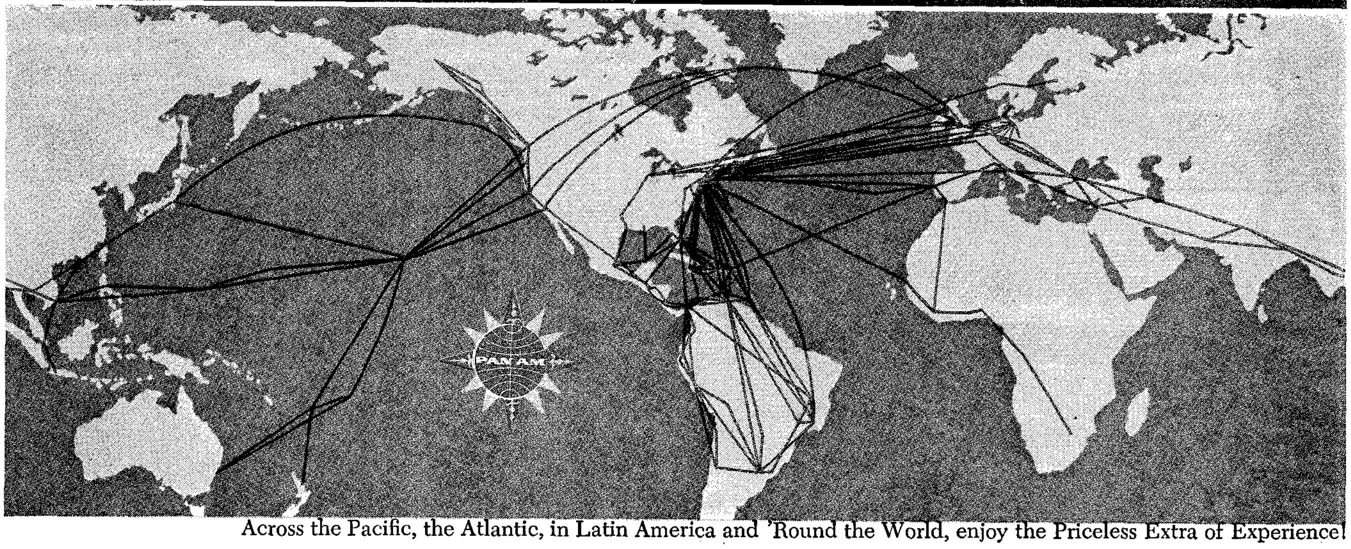

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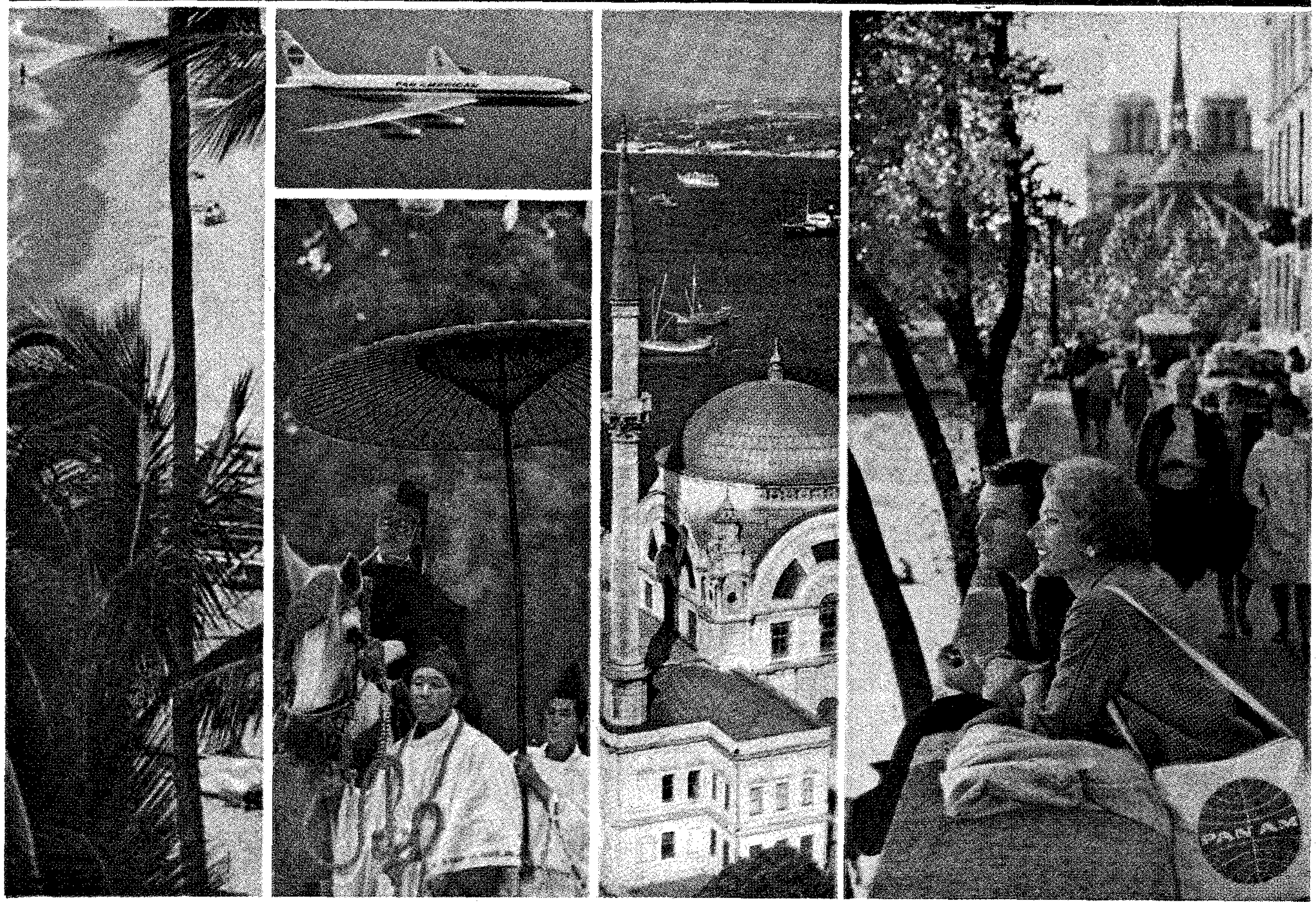

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